AVIATION

The Oldest American Aeronautical Magazine

DECEMBER, 1930

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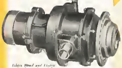

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The Oldest American Aeronautical Magazine

EDWARD P. WARNER, *Editor*

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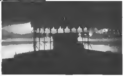

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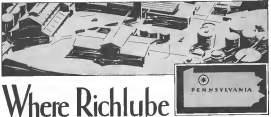

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EDWARD P WARNER, *Editor*
Volume 29 . . . **December, 1930** . . . Number 6

SATURATION POINT?

FOR over a year, the total number of airplanes available to be used in the United States has remained almost constant From the high of last January, it has actually slipped back about ten per cent The aircraft industry has to take its choice between an indefinite easy continuance at present levels and a prolonged and strenuous and expensive effort to find a path that leads upward It may not exist, but it probably does If it exists, a sufficiently thorough search will find it, but it will never discover itself without the search Are the manufacturers of aircraft content to remain a small industry, with an aggregate production of sixty or eighty million dollars a year and that largely military, or do they intend to become a great one? Have the bright hopes of 1928 been cast away, never to return? Some of them were the distorted fancies of inflamed imaginations, but others, by no means realized as yet, are quite within the area of reasonable possibility—more so now than two years ago Is the airplane to be simply a weapon of war, an instrument of public transport, a vehicle for a few industries or individuals so specially circumstanced or so enthusiastic that they can afford to ignore the difficulties that keep the great mass of mankind out of the air?

No disrespect is intended to air transport in putting it lightly aside as though it were a minor matter Transport operations can and should be of immense scope It will certainly be the case this year, and it may well continue true in 1931, that the gross receipts of the air transport lines under American management will exceed the total retail value of all the commercial airplanes built in the United States We even believe that at some time within the next four years the aggregate annual income from transport operations will surpass the record-breaking commercial plane and engine production of 1929, $51,000,000 But air transport exists as a separate activity It is a branch of transportation, not a branch of industry Its contribution to the prosperity of the airplane manufacturers as a whole, as they are now organized, is relatively slight It is hard to imagine, for many years to come, a normal consumption of new equipment by transport lines amounting to more than $30,000,000 a year. To reach even that figure, something over ten times the present volume of traffic will be needed

For aircraft manufacture on the grand scale, there is but one salvation,—the privately-owned or industrially-owned plane Only from the sale of airplanes in quantity to individuals or to business enterprises can enough trade be had even to regain the scale of 1929 production For the past year, editorially and in feature articles, we have drilled away upon the importance of cultivating the private pilot, increasing his numbers, and providing new interests for him until we have been accused of making it an obsession It had better become an obsession with any manufacturer who expects to stay in business, except for the limited number who deal with the Army or Navy and the still more restricted group who have established themselves firmly in the field of transport manufacture—a field that cannot accommodate more than five or six at most

It is, however, unhappily plain that the number of individuals, or managers of corporate activities outside the aeronautical world, who are willing to buy present day airplanes and operate them under present conditions is comparatively small The "saturation point" at which we now stand is apparent rather than real It is due in

large part to the general business depression. We have not reached the end of our market yet, with an improvement of general business conditions many new buyers will appear; many more can be found by vigorous and intelligent effort, but the numbers will still be modest, compared with the consumption of many other commodities, unless there is some fundamental change.

And there we face the decision referred to in our opening paragraphs. We can continue to build essentially the present type of airplane, and provide essentially the present type of airport and service facilities, and we can sell three, or four, or five thousand a year. It will be a nice business, if a small one, when once both physical plant and "mental overhead" have been adjusted to its magnitude and morale has been regained. Or we can take another course, a harder and a more uncertain one.

We can insist on the general provision of really adequate service, such service as the automobilist can commonly secure and such as pilot-owner already has at his disposal in a gradually increasing number of exceptionally enlightened localities. It ought to be unnecessary that the owner ever give a personal thought to the mechanical detail of his plane or that he ever soil his fingers on it or lift a piece of cowling. The sportsman or business man traveling by air should be the object of solicitous attention whenever he arrives at an airport. At present there are many fields where he gets either indifference or scorn. To rectify bad service conditions requires no great outpouring of money. It needs principally recognition that the problem is deserving of a little intelligent attention.

That much is comparatively easy to accomplish, and it is important. But there is more to be done. If the manufacturer of airplanes really wants to find himself a part of an industry of the first rank it is time that he formulated a new idea of what ease and safety in flying ought to mean. Admirable as are the planes of the present day, they are not good enough. Private individuals will not fly in great numbers as long as insurance companies feel it necessary to discriminate against their flying. We shall reach a proper standard, from the point of view of the multitude, when all such discriminations can be abolished, when the process of learning to fly, attaining real competence in piloting, can be compressed within a single afternoon, when accidents due to spinning and stalling have become literal impossibilities, when comfort and vision have been greatly improved, and when the noise of engine and propeller has been brought within excusable limits.

That ideal may not be fully realizable. The potential prize for realizing it is great,—great enough to justify a deal of research. There have been encouraging signs within the past year. The Tanager, the Doodlebug, and the Autogyro are cheering lamps upon the road. At least it is sure that we shall not hit the mark if we do not aim at it,—and upon our success in hitting it hangs, in large part, the determination of whether the saturation point is uncomfortably close at hand or so far away as to be almost invisible.

A CHANCE FOR A TRIPLE PLAY

BEING blessed with a singularly elaborate system of government in the United States, every now and then we get tangled up in it. Desirable objects fail to get themselves accomplished when they suffer a head-on collision with the general willingness to have some other fellow foot the bill. Federal, State, and municipal governments in unison politely decline that honor.

The government at Washington has held inflexibly to its rule of constructing no airports. In terrified anticipation of an aeronautical pork barrel, the pledge of abstention from the airport field was written directly into the Air Commerce Act.

State governments, with three or four exceptions and those only for individual special cases, build no airports. Rural legislators hold any such proposition suspect as a trick to favor the cities. A somewhat larger number, but still only a few, spend money on laying out local airways.

Municipalities carry the airport load—sometimes. Several hundred American cities have provided fields at least good enough to be listed with the Department of Commerce though often far from adequate. Several hundred others have not done even that much.

The airport situation is, in short, unsatisfactory. In spite of all the ballyhoo of the last three years, in spite of the really admirable initiative of a small number of communities, it remains unsatisfactory. Furthermore, it tends to become static. New fields are being added to the list at a declining rate.

All of which constitutes what Noah Webster would classify as a dilemma. Where do we go from here? And how to start the machine moving again?

Look to experience with highway construction. That too, once went forward slowly and uncertainly in many areas, uncoordinated and often unintelligent. Then the Federal government stepped in, with a plan for constructing no highways of its own, but proposing to make partial contributions to assist in the development of State roads approved as forming logical parts of a coherent national system. Federal aid, experimental in the beginning, grew and grew, and in the present fiscal year the Federal appropriation amounts to $125,000,000.

We now have a very limited number of airways with backing from Washington, and organized there. The traveler by air wants to be able to go anywhere. He claims the right to consider the country under him as an area, not as a wide-meshed network of a few straight lines. He wants the privilege of landing near his destination, even though there is no city or town there that is financially strong enough to maintain a proper field.

Consider the highway analogy. We need an incentive to airport and emergency field construction, and a means of bringing pressure upon the laggard. State aid and Federal aid are obvious possibilities. Suppose we extend the highways upward. Suppose we extend the co-operative boosting process a stage further, and involve three governments instead of only two.

Subject to proper limitations to insure against Treasury raids by communities quite capable of carrying their own burdens, and against waste and graft and other obvious dangers, let the States undertake to pay some minor fraction (perhaps 20 per cent) of the cost of land and certain necessary improvements on sites permanently dedicated to airport service. Let State governments further provide emergency fields, spotted in at strategic points where there is no local center of population to pay even a part of the bill, with the ultimate object of having no point within the State boundaries more than ten miles from a good landing-place.

Then let the Federal government make the same offer, of carrying a minor percentage of certain portions of the outlay, to the States. The final result would be that the powers at Washington would contribute four or five per cent of the cost of certain municipal airports. The total burden on the Federal budget would hardly exceed five million dollars a year at the peak. That nucleus would have to draw out from the States perhaps forty millions, from the cities a hundred or more. Yet so eager are we all to get something for nothing, and to take advantage of any offer of financial assistance on almost any terms, that even that modest bait would start airport construction in cities where projects have lain in the doldrums for years and seem likely to vegetate indefinitely. We are so confident on that point that we put it as a flat statement, without a single qualifying clause.

We repeat our oft-voiced objection to vague and grandiose schemes of subsidy. Every suggestion of Federal aid must prove itself both necessary and practical. We are always reluctant to take them up, but we believe that the plan so broadly outlined here fully meets the conditions, and that the measure of centralized control that it would provide would make for economy, rather than extravagance, in airport operations. Try it on your newly-elected Congressman. Remind him of the history of Federal highway aid, and offer him the aeronautical equivalent, as here outlined, as a practical means of expressing that abstract aeronautical enthusiasm that possesses nine out of every ten statesmen.

SERVICE TO PASSENGERS

THE first objective of an air line is to get traffic, and to get it on such terms that the service will ultimately pay for itself. The minimum cost of operating airplanes is quite high enough at best without adding to it, and to the fares which must be collected from the passengers, by introducing unnecessary and expensive frills. But unnecessary frills are one thing, and auxiliary services which the traveler has a right to expect are quite another. The distinction must be respected.

This editorial is being typed in the cabin of a tri-motored ship, on a flight of several hours' duration. The company's staff both in the air and on the ground, are irreproachably courteous and attentive. The printed matter available in the cabin comprises a few time-tables and circulars giving the rates of fare. The country over which we are flying is both lovely in itself and fairly saturated with historical interest, but the occupants of the cabin are left to admire the view without having any means of finding out where they are, and whatever they know of the local history they learned on their own account before buying their tickets.

The trip started early in the morning. An hour before the assigned time of take-off, no telephonic communication could be had with the company's local office, and no one in any of the principal hotels was able to say whether or not there would be a bus service to the airport to connect with the plane or, if so, when the bus would start.

These are matters of first-class importance. Air transport is on trial. Still patronized largely by the aeronautical enthusiasts, it is only gradually making its way among business men who care more about aviation than they do about railroading, and who want only to consider it as a branch of transportation on a complete parity with the railroad. Their frame of mind is totally different from that of the conventional passenger of a few months ago, and it is their frame of mind that will have to determine the air transport policies of the future.

About the real sources of difficulty or danger in flying they know nothing and, once they have made up their minds to use the air line, they seem to care less. They expect the pilot to know, and they trust him with a beautiful and perfect trust. More than once we have had the experience of running into thick weather over bad country, when the aeronautical people on board sat tense and peered into the gathering haze, while the business men with no flying experience except as passengers on the lines remained as calm and unconcerned as when we had been three thousand feet high with visibility and ceiling unlimited.

On purely aeronautical matters they need no reassurance or explanation, but there is one thing that they will not forgive. There is one thing that will damn air transport beyond redemption among the people upon whose support its future depends. There must be no apparent lack of solidity of management. The service must at all costs avoid the half-baked aspect, the uncertainty and the lack of specific information about what comes next, that is still to be encountered at times. To be told by the porter at a leading hotel that "sometimes they run a bus to the airport and sometimes they don't, and it don't always start from the same place" (that actually happened to us recently) is enough to start the average traveler off for the Union Station and a Pullman car.

In most respects there has been great improvement during the last year, but there is a real risk now that the quest of economy, altogether proper in itself, may cause some backsliding on service essentials. The absence of maps or guide-books on the ship that we are riding at the moment is a case in point. The business traveler,

already invoked as the custodian of our future destinies, has but little interest in the technical details of the airplane. He is likely to have a great deal in the country over which he is passing. A map (pictorial and descriptive, not navigational) is the least that he should receive. The company that wants its customers not only satisfied but enthusiastic will go farther. It will do what most railroads now do for their limited trains and print a special guide, with historical anecdote and with information about the people that live on the ground below. Twenty-five cents a passenger would be a liberal estimate on the cost of such a service. No quarter could possibly pay a larger return.

TEST PILOTING AND DESIGN

TEST piloting has become a profession. Under the joint spur of a highly competitive market and of the Department of Commerce's insistence upon irreproachable flying qualities, the responsibilities of the man who flies the plane in its preliminary trials have so increased and diversified that the mere ability to fly, and to fly surpassingly well, is now only a minor one of his qualifications. His training is as specialized as his duties. But an unwisely exhaustive training is as dangerous as an incomplete one if it leads the pilot to mistake his own functions. There rests upon the test pilot no obligation to replace or displace the airplane designer. If a little knowledge of design theory leads him to any delusions of grandeur of that order—and it has frequently happened—he would be better off with no knowledge at all.

A new machine wheeled out on the line for the first time, has to be considered as potentially a sick airplane subject to all sorts of ailments. The medical profession has been studying the treatment of illness for some hundreds of years, and the practice that has stood the test of time for them deserves examination by engineers. The doctors divide their attack on their problem into three stages: observation of symptoms, diagnosis, and prescription for cure. Test pilots who, without adequate reason, fancy their own qualifications as designers are prone to run all three into one.

Every airplane engineer is acquainted with the pilot who flies a plane for the first time, puts it through a series of exercises devised by and known only to himself, and then comes down and announces that the aspect ratio is too high, or that the oleo gear is too stiff, or that the fin is too small. He may be right. The man upon whom the responsibility finally rests, the designer, has no way of knowing whether he is or not. He has no basis for a rational decision upon his own course of action. He can only decide whether or not he is justified in placing a blind faith in the pilot.

That is all wrong. The pilot except in those exceedingly rare instances where he is a really first-class aeronautical engineer as well, should have nothing to do with either diagnosis or prescription. He is a specialist, whose sole function is to determine the symptoms and report upon them—fully and intelligently. Unless he gives such a report, no intelligent diagnosis can be made by anyone—not even himself, for the physician who allows himself to jump at a conclusion before all the evidence has been secured and tabulated is in grave danger of bending any facts accumulated thereafter to make them fit his preconceived theory.

Five years ago, that was the common case, and the development of practical design, and the art of getting the desired flying qualities, were immeasurably retarded as a result.

That is one danger. There is another, at the other extreme. As the converse to the pilot who knows too much, and wants to tell the designer what to do without telling him why, there is the pilot who is so inarticulate that he can't tell the designer anything in any language that that unfortunate gentleman can understand.

Take an example. The scientific study of landing and the design of machines that would land properly was fog-bound for years while pilots spoke of "floating" and "settling" and "pancaking" and "bouncing," and designers spoke of "ground effect" and "impact stalling moments" and "hysteresis," and neither party had more than a vague idea of what the other was talking about. Both were perfectly competent, in their respective fields. All that they needed was an interpreter.

They should need that no longer. The test pilot has been learning his job and its vocabulary, and the designer has been acquiring a new respect for the pilot's opinion. What is most wanted now is frequent reminder of the location of the dividing line between their respective activities.

The pilot comes in from the flight, and he reports, in minute detail what happened. Every movement of the controls, every phase of the subsequent behavior of the machine, everything that he could see or hear or feel is part of his story, supplementing the records of all the recording instruments that could conveniently be supplied. Up to that point the pilot is supreme.

Thereafter, his role is secondary. His advice and suggestions ought to be welcomed—they may be sought—but the decision lies elsewhere. Until all the evidence is in there should be no decision by anyone. Unless the pilot's report is complete and absolutely unprejudiced, the ultimate decision will probably be wrong. Unless the pilot commands the designer's complete confidence so that the correctness of his report is taken for granted as one of the fundamentals of the problem, the same dismal outcome is in prospect. The best airplanes, except in those rare instances already referred to in which the same individual is really highly qualified in both capacities, result from a harmonious combination of engineering and flight test departments speaking the same language and having a general understanding of each others problems and methods but each religiously avoiding any tendency to short-circuit a part of their own proper function by encroaching upon their neighbor's.

The Trend of Activities

SALES, PRODUCTION AND GENERAL

ACCORDING to a report issued by the Aeronautics Branch of the Department of Commerce, the total number of commercial airplanes produced by American manufacturers in the first nine months of this year totalled 2,154. The Branch's report states that these planes were manufactured by 296 companies or individuals. Thirty-eight companies built more than ten aircraft each or 81.03 per cent of the total manufactured for domestic use. Three companies built more than 100 planes, six companies built between 50 and 100, fourteen companies built between 20 and 50 and fifteen companies built between ten and twenty planes. By classifying the total figure of 2,154 according to type, it is found that 945 were monoplanes and 987 were biplanes. Four hundred and forty-five of the planes were open cockpit land planes with a carrying capacity of one, two or three persons. Four hundred and sixty-eight were cabin land planes, carrying one to ten people. There were six monoplane boats manufactured, nine monoplanes that could be converted to land or seaplane and 17 monoplane amphibions. Regarding the total number of biplanes 846 were open cockpit jobs for one to five passengers and 17 of them were cabin jobs with a capacity of one to eight persons. Added to that, there were 18 biplane flying boats, 50 convertibles and 56 amphibions.

In addition to the number of aircraft produced for commercial use during the first nine months of the year 556 military planes were delivered to the Army and Navy. That makes a grand total for the nine months period of 2,710. According to the Department's report the export of commercial planes during the nine months period totalled 198.

The above figures give indication of the fact that during the months of July, August and September aircraft production in the United States progressed at a more rapid rate than at any other time during the year. During the first six months of the year there were only 1,325 planes manufactured in this country for commercial use. That figure compared with the nine months' figure of 2,154 shows an increase of 829 planes manufactured for the third quarter of the year or a little less than half of the total production for the year thus far. A rather good idea of the slump in aircraft manufacture during the 1930 period can be obtained by subtracting the nine months total for 1930 from the grand total of 1929 which was 5,357. The difference is 3,203 planes produced for the industry. To equal 50 per cent of the 1929 production, the industry must produce during the months of October, November and December a total of 524 planes.

Although that is quite possible of accomplishment, it is not believed the manufacturers will produce this number during the last three months. At the present time, the manufacturers are concentrated upon the idea of developing new markets during 1931 and working overtime at the drafting board on ideas which, when a completed product, will fulfill the demands of the new markets.

A comparison of yearly production since 1927 presents a rather interesting picture. In 1927 there were 1,653 commercial airplanes produced and 700 military craft, making a total for the year of 2,353. In 1928 there were 3,865 commercial airplanes produced and 1,094 military, making a total of 4,979. In 1929, there were 5,357 commercial planes produced and 590 military, making a total of 5,947. As stated above, for the first nine months of 1930, there were 2,154 planes produced and 556 military planes, making a total for the nine months' period of 2,710 planes. Thus it will be noted that the peak year for aircraft production in this country was 1929 and that this year's production will only be slightly higher than the 1927 level. With reference to the figures stated, it should be remembered that they are figures on production only and not on aircraft sales. Although a considerable portion of 1929 production has been removed from the manufacturers' shelves during the first nine months of this year, there are still some left and it is altogether probable that 1931, at least the early months of 1931 will witness the sale of both 1929 and 1930 production that has been carried over on the shelf.

✦ WITH regard to aircraft sales by individual companies, it is interesting to note that the Detroit Aircraft Corporation of Detroit, Mich., reports a gross sale in October of nineteen airplanes having a total value of $166,110. The company states that this is the largest amount of business ever booked in any 30 day period by the company. Incidentally the Lockheed plane is now known as the Detroit Lockheed.

✦ THE Swallow Airplane Company of Wichita, Kansas also reports a very satisfactory and encouraging sale of its product during October. The Pitcairn Cierva Autogiro Company, of Pennsylvania, has definitely announced that it has gone into schedule commercial production of its product, the Autogiro, which has aroused increasing interest during the last year. Production of the first model is now under way and within the next two or three months a number of machines will be completed and ready for distribution.

✦ ANNOUNCEMENT was made last month that two contracts for new aircraft equipment, totalling a value of $235,209.00 had been awarded by the War Department. The Wright Aeronautical Corporation, subsidiary of Curtiss-Wright has received a $214,892 contract for 40 Cyclone engines with spare parts. Twenty of the power plants are to be installed in Fokker single-seat cargo planes. The rest will be used as spare engines. The other contract amounting to $20,316 has been awarded to Detroit Aircraft for a Detroit Lockheed, powered with a Pratt & Whitney Engine.

✦ UNITED AIRCRAFT & Transport Corporation and subsidiaries report a net profit of $1,149,614 for the third quarter of this year. A net profit for the total nine months periods of 1930 is stated to be $3,252,145. The company states that on September 30 unfilled orders were at the level existing throughout the year. The company believes that there will be little change in their business for the last quarter.

✦ AS A means of improving its servicing facilities, Warner Aircraft Corporation manufacturer of Warner Scarab Engines, has appointed Aero Motor Service, Oakland Airport, Oakland, Calif., as an authorized service and replacement parts depot. The company has already authorized depots at Roosevelt Field, New York, and the Municipal Airport, Chicago.

✦ A SEMI-ANNUAL report of aircraft accidents during the first six months of 1930, released last month by Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, states that there was a slight increase in the number of miles flown for each accident in civil aeronautics in this country over the same period for 1929. During this period civil aircraft in this country flew a total of 68,669,928 miles in scheduled air transport and miscellaneous operations. That figure represents an increase of almost 12,500,000 miles over the 1929 period. In the scheduled air transport operations during the first six months of this year, there were a total of 16,902,728 miles flown, and there were six fatal accidents. Thus, 2,817,121 miles were flown

by our transport planes for every fatal accident For the 1929 period, there were 9,201,338 scheduled miles flown and nine fatal accidents, or a fatal accident for every 1,022,371 miles

Considering all classes of accidents in scheduled air transport operations (fatal, non-fatal and accidents involving no injuries whatever), the miles flown per accident for the first half of 1930 totaled 384,152 as there were 44 accidents For the corresponding period in 1929, the total number of accidents was 61, which placed the miles per accident at 150,842

Regarding miscellaneous operation, there were for the first six months of this year 51,767,200 miles flown and 144 fatal accidents, or 359,494 miles for every fatal accident This represents a decrease over the 1929 period as during that time the total mileage was 47,000,000 miles and the fatal accidents were 118, or 398,305 miles flown per fatal accident. Of course, it should be understood that a fatal accident is one in which one or more persons, passengers, pilots, or crew, were killed or fatally injured.

As for the total number of all classes of accidents during this period, the report states that in 1930 there were 886 accidents in miscellaneous operations That makes the miles per accidents in miscellaneous operation 58.427, also a decrease over the 1929 period

For all classes of accidents in all classes of aircraft operations, the figures show that there was one fatal accident in the first half of 1930 for every 457,800 miles The total accidents amounted to 150, that is, fatal accidents and the total mileage was 68,659,928 For the 1929 period, the mileage flown totalled 56,201,338 and there were 127 fatal accidents or 442,530 miles flown for every accident

✦ A new policy recently adopted by the Aeronautics Branch of the Department of Commerce permits prospective purchasers of approved type aircraft and prospective students of approved flying schools to handle the controls of aircraft limited to demonstration flights

In making the announcement, Colonel Young stated,

"This policy makes it permissible for transport pilots, who are employed regularly by manufacturers, distributors or dealers of approved aircraft, to demonstrate the flying characteristics of aircraft to bona fide prospective purchasers by permitting such prospects to handle the controls while in flight. The policy also applies to transport pilots holding Flying Instructors' Ratings and regularly employed by flying schools holding an Approved School Certificate and permits such pilots to demonstrate the operation of the aircraft to prospective students by permitting them to handle the controls while in flight. All such flights shall be limited in character, neither prospective students nor purchasers will be deemed to be airmen as defined by the Air Commerce Act of 1926 The demonstration flight shall be given to the prospective purchaser or student without charge and no remuneration shall be received by the firm or school, either directly or indirectly other than such as may result from the sale of the aircraft or the course of instruction The persons involved will be held strictly accountable for the provisions of this policy."

✦ With the idea of securing uniformity of federal, state and municipal air laws, regulations and practices, Secretary Lamont has extended the invitation to the governors of the 48 states to send two representatives to Washington on December 16 and 17 for a conference on this subject. The conference will be known as the National Conference of Uniform Aeronautic Regulatory Laws, and will be sponsored by the Assistant Secretary of Commerce for Aeronautics and his staff of the Aeronautics Branch The program will include five fundamental subjects They are

1 Uniform basic regulatory state air law

2 Adoption of federal air traffic rules by the states for purposes of local enforcement.

3 Methods of local enforcement

4 State enabling act for airport acquisition and control.

5 Uniform airport rules

The industry will be represented at the conference by delegates designated by the Aero Chamber of Commerce Representatives of the U S Chamber of Commerce and the National Aeronautical Association will also attend

✦ On September 15, the New Jersey State Board of Commerce for Navigation made a ruling prohibiting the use of aircraft of any type on any of New Jersey inland waters The New Jersey Board held that aircraft flying over inland waters constituted a menace to surface navigation. As a result, H Stewart McDonald, general counsel for the Chamber, represented that body at the hearing After hearing the arguments, the New Jersey Board of Commerce and Navigation adopted a resolution modifying its previous ruling so that the use of Lake Hopatcong (operation on this lake resulted in the original ruling) by aircraft is specifically forbidden and other permits will be considered on their own merits at the time application for them is made

✦ As the result of a meeting held in Salem, Ore, attended by representatives of the State Traffic Department, Highway Commission, State Board of Aeronautics and Federal Government, steps will be taken to make amendment to the State Aeronautics code regarding the joy hopping operation of airplanes on the Oregon beaches It was the consensus of the meeting that 95 per cent of the existing hazards resulting from airplane operations would be eliminated through a law preventing so called joy hopping Provisions are to be made for designated areas for the landing and taking off of airplanes on the beaches The proposed areas will be marked off or fenced and be patrolled by the State Traffic Division in co-operation with local officials Under the Oregon law, all of the Oregon beaches have been designated as state highways, with the exception of approximately 25 miles located in Clatsop County.

The meeting was called as a result of numerous complaints received from seashore residents where the joy hopping business was flourishing during the summer months H E Hoss, secretary of the state, recently issued an order forbidding airplanes from landing on any of Oregon beaches

✦ The Aeronautics Branch has received an unofficial report of the first provision pronounced by a French court involving the air code adopted by France, May 31, 1924 The report states that the Court held promoters of an air meet responsible for injuries suffered when one of the pilots crashed into the crowd, regardless of the fact that the pilot was not one of the advertised performers and had only been requested to fly after he had arrived as a visitor. The accident occurred during a meeting at the Naval Aviation Field at Orley when a naval officer participating in a dead stick landing contest overshot the mark, misjudged the distance and landed among the spectators.

Counsel for the French Pilot Union maintained that the officer's name was not on the program, that his participation in the contest was not a source of profit to them and that, therefore, the Union should not be held responsible for his accident However, the court ruled that the organizer of the celebration was the beneficiary thereof and that the fact of the temporary connection with the Union of the naval officer made little difference

✦ The Annual Meeting of the Aeronautical Committee of the California State Chamber of Commerce was held in San Francisco the latter part of October in connection with the annual convention of the Californian State Chamber of Commerce The Aeronautical Committee sessions extended over a period of two days and were attended by about 100 leaders in California aeronautics While most of the more vital problems confronting the industry in California were discussed the general opinion was that all legislation on aeronautical matters be delayed until California had more experience as to what was actually needed Among the points brought out during the meeting was the fact that some change must be made in the law as regards the collection of gasoline tax. In California this tax now goes for road building purposes even though levied on aviation gasoline, unless the tax is specifically refunded when requested by use of airplanes As experienced in other parts of the country, the obtaining of a gasoline tax refund requires certain legal expenditures

Additional legislation was also requested regarding the regulation and

operation of airports in California, particularly as to their location, size and facilities This was put forward with the hope of less accidents and more safe flying The matter of glider and glider regulation was also discussed and it was agreed that no legislation was desired at the present time, the problem being one of general education

With regard to the limitation of liability for accidents, C. H. Fry, of the Industrial Accident Commission, offered his services in an effort to cut down the number of accidents now occurring to employed pilots in the State of California It was brought out that there have been 311 industrial air accident deaths in the State of California in the last ten years and that there have been only 22 industrial aeronautical accident deaths so far in 1930, that is, up to the middle of October It was, therefore, felt that the accident rate was too high and Mr Fry recommended that the State Industrial Accident Commission be granted more power to control companies employing pilots

✦ Among the announcements of personnel changes in the industry during the last month is one from the Detroit Aircraft Corporation stating that P. R Beasley, President of Beasley-Eastman Laboratories, Inc, has been elected president of Detroit Aircraft Corporation to succeed Edward S Evans, who resigned in order to devote more time to his other business interests It was stated by the company that Mr Evans had agreed to take the presidency originally only until all of the company's far flung units could be centralized in Detroit. With the exception of the Lockheed plant in California, that has been accomplished, Mr Evans has by no means severed complete connection with the Detroit Aircraft Corporation He has been elected chairman of the company's executive committee and as such will continue to play an important part in the company's operations In a final report to the directors Mr Evans stated that the company had unfilled orders on hand amounting to $1,119 840 The new president assumed his duties November 1

✦ After a delay of twelve years, Captain Edward V Rickenbacker present vice-president of the Fokker Aircraft Corporation and ace of aces of the American air forces in the World War, received the Congressional Medal of Honor from the hands of the President last month Rickenbacker who is now a colonel in the Reserve Corps was officially credited with the destruction of twenty-one enemy planes and four enemy balloons The citation of the act for which Rickenbacker received the medal was to the effect that on September 25, 1918, he attacked seven enemy planes single handed and shot down two of them and drove the others to cover. Rickenbacker already holds the Distinguished Service Cross with seven oak leaf clusters

AIRLINES AND AIRPORTS

In response to the Watres Air Mail bill, Eastern Air Transport, Inc, operators of the New York-Miami air mail service and the New York-Philadelphia Baltimore Washington-Richmond passenger line, will soon make important expansions of its passenger accommodations

The company has projected passenger service along its coastal route for many months and on August 18 inaugurated the service between Richmond and New York. On December 10, this is to be extended south to Atlanta and, it is expected, still further south to Miami on or about January 1. On December 15, the company plans to install three Curtiss Condors in the New York-Washington Section, and increase the frequency of service, the schedule to be announced later

The future schedules will include the present air mail runs, plus the new passenger services This will provide a total of four round trips daily between Washington and New York, three round trips daily between New York and Atlanta, and two between Atlanta and Miami Mail will be carried on the passenger planes as well as on the mail planes. The company will use the regular Pitcairn Mailwings on all its exclusively mail runs, Condors between New York and Washington, and south of Washington the Curtiss Kingbird.

Expansion of this route is particularly potent because of the important connections made. It will link together the Colonial Airways System, the three transcontinental lines and the Pan American System, for both passengers and mail Schedules will be speeded up considerably by the opening of the Richmond Jacksonville cut off early next year

The company will operate with the usual radio communication radio range and other air navigation guides, and in addition plans to install the Gyro-Pilot the Gyro-Horizon and Directional Gyro—devices developed by its associate, the Sperry Gyroscope Co The company recently moved its New York base from the Glenn Curtiss Airport, North Beach, to the Newark Airport where it is building a 120 x 160 ft hangar to cost about $135,000. Some time ago it completed an air terminal building at Candler Field, Atlanta

✦ Transcontinental & Western Air opened its through, 36-hr coast-to-coast mail and passenger service on Saturday, October 25, as scheduled. On that day, ten of the company's Wasp powered Fords took off from the East and West terminals and division points for the first through operation Two planes took off from Newark Airport, one in each direction from Kansas City, one in each direction from Amarillo and two from Los Angeles for the East and two from Los Angeles to San Francisco

The all-the-way-by-air passenger service starts from Newark Airport at 8 a.m daily and from the Alhambra Airport at Los Angeles at 5 a.m daily. There is in addition the transcontinental air-rail service This has been changed somewhat, chiefly in regard to the route flown west of the Mississippi, as described in this magazine and The Aviation News

The two new transcontinental mail and passenger routes announced the following traffic figures

Transcontinental & Western Air carried capacity passenger loads out of New York on the six days preceding the report An average of six per day were using the air rail service through Columbus. An average of nine persons per day were leaving Los Angeles, about half of them making the through trip Weather conditions and lack of lighting on the eastern end accounted for a few incompleted or cancelled trips

Southern Air Fast Express carried 341 pay passengers in the period October 17-31 In the period October 15-31 the line carried 11,433 lb. of mail and the planes were flown 72,743 mi

✦ Due to improvement in South American political conditions, Pan American Airways System inaugurated the new Paramaribo-Santos (Brazil) mail service as far south as Para (Brazil) on Nov 13 This contract was awarded on September 24 and service was to start on a weekly basis October 20 Political uncertainties forced postponement

Pan American Grace Airways, operating twice-weekly mail service between Cristobal, Canal Zone, and Buenos Aires and Montevideo by way of the West Coast of South America recently completed its millionth mile flown This route is about 4,600 mi long and is flown on a five-day schedule A Curtiss Falcon, equipped with oxygen, recently was installed for the trans Andine run on which mail only is carried The company recently acquired three Fords for use on a 612 mi. run between Talara and Lima, Peru.

✦ The Ford company's private freight air service between Detroit and Chicago and between Detroit and Buffalo by way of Cleveland, had on October 23 carried 10 000,000 lb of freight over these lines This amount of freight would fill to capacity 250 freight cars.

The first service was that between Detroit and Chicago, opened April 13, 1925 and using one of the first single-engined Ford transports. On July 1, of the same year, a similar service was started between Detroit and Cleveland and on March 28, 1927, this was extended to Buffalo Planes are operated six days a week on regular schedule and their total loads now average 60,000 lb each week

✦ Clifford Ball, Inc., and Pennsylvania Air Lines, Inc, which started operation at the Pittsburgh-Cleveland air mail service on April 21, 1927, and the Washington-Pittsburgh passenger service on Aug 17, 1929 have joined

forces with the Pittsburgh Aviation Industries Corp Operations of both lines will be continued under the name of Pennsylvania Air Lines. Bettis Field will be used as the operating base but the headquarters will be established at the Pittsburgh Aviation Industry Corp's airport, known as the Pittsburgh-Butler airport

Richard W. Robbins, executive vice-president of Pittsburgh Aviation Industries Corp, will be president of the new company and Clifford Ball will be vice-president and general manager Passengers and express are flown once daily between Pittsburgh and Washington, passengers and express are flown also once daily between Pittsburgh and Cleveland, and mail and express are flown twice daily between Cleveland and Pittsburgh

✦ FIVE of the older contract air mail operators began operating under the provision of the Watres Bill November 1 According to a statement by Earl B Wadsworth, superintendent of air mails for the Post Office Department, two of these companies will receive under the new arrangements slightly less income while the other three will receive slightly more

He said National Air Transport, operating the New York-Chicago route, will earn about $6,000 less per month, the total revenue dropping from about $122 000 to $116,000 Boeing Air Transport, which operates the Chicago-San Francisco route, will receive a total of about $269 755 per month, as compared with $344,000 per month under the old arrangement. This means a drop from $1 53 per mile to about $1.20 per mile

Colonial Western Airways, operating between Albany and Cleveland, will receive an increase from $0 28 a mile to $0 70 a mile Western Air Express will receive an increase from $0 56 a mile to $0 70 a mile on its Cheyenne-Pueblo run and Continental Air Lines, operating between Cleveland and Louisville, will receive an increase of from $0 40 per mile to $0 70 per mile

✦ A NEW solution to the controversy regarding co-pilots on passenger transport planes seems probable. The Aeronautics Branch announces that two inspectors are making a survey of airlines to determine what exceptions if any may be made to the amendment to the Air Commerce Act promulgated August 15

Waivers may be granted if the inspectors make the necessary recommendations, to airlines whose volume of business nature of the country over which service is maintained distance of the trip flown indicates that the additional pilot is not necessary to safety of passengers

✦ COL. PAUL HENDERSON has been named president of National Air Transport, a division of United Aircraft & Transport Corp to succeed F B Rentschler, president of the latter company Colonel Henderson formerly was assistant postmaster general in charge of air mail and has been vice-president of National Air Transport for three years

✦ THE proposed Arctic airway between North America and Europe has received much attention in recent months At present, an English expedition is making an exhaustive study of meteorological and terrain conditions with such an airway in mind. Further, assistance to such a development has been given by Vickers of a Vicker seaplane for use in blazing an air trail over this route Arrangements are in progress to make the necessary fuel caches and other ground arrangements The distance between Winnipeg and Edinburgh is about 4 000 mi over this route.

✦ A CUT in rates on the St Louis Memphis-New Orleans route operated by Robinson Airlines Inc, has taken effect The through fare has been reduced from $45 00 to $31 50 During the first 6 mo of operation the company carried 1,236 passengers over the line. It was inaugurated April 27, 1930

✦ NATIONAL AIR TRANSPORT reports net profit of $229 165 after charges and Federal taxes for the quarter ended September 30 and a net profit for the first 9 mo also after charges and taxes, of $576 392 This is a decrease as compared with the net profit of $243,221 in the quarter ending September 30 1929

✦ ON request of the Post Office Department, National Air Transport has been experimenting with a new type of air mail compartment for use on passenger transports This utilizes space in the wing and includes a trap door arrangement which allows the mail bags to be loaded and unloaded within entering the passenger compartment This is considered likely to lessen fire hazards, due to its position in the wing rather than in the tail and the idea seems quite promising

✦ THE City of Boston has secured Governor's Island in the Boston Harbor as an addition to its expanding municipal airport The War Department, which has controlled the island since the war, has agreed to make it available to the city for airport use This will make possible development of a tremendous landing area affording the city one of the finest airports in the entire country. Bids have been received recently for 500 000 cu.yds. of fill to be added to the present surface

✦ INDIANAPOLIS's new municipal airport was opened Saturday, October 25. The field, almost square in shape, consists of 947 acres, situated about 6½ mi. from the center of the city by a 40 ft paved road. Nearly $700,000 has been expended on the field—including the purchase of the land at an average of $292 an acre—on three concrete runways, and a combination hangar-administration building Runways taxiways, aprons, drives, sidewalks and curbs all drainage and grading, storm sanitary drains, septic tanks and other miscellaneous items were constructed in 5 mo by the R McCalman Construction Co of Danville, Ill, at a cost of $167,000

FLIGHTS AND COMPETITIONS

TWO words—"Do X" and "Hawks"—have appeared with almost regular frequency in the news of the month At present, the former is completing preliminary legs of a Lake Constance, Switzerland, to New York flight. Officials of the Dornier works in speaking of this flight have pointed out that it must not be placed too high in the field of ambitions "We have all year to make this flight and we do not intend to rush anything" states Comdr Friedrich Christiansen "No record will be attempted, the greatest attention will be paid to weather conditions—'safety first' is the slogan Commercial efficiency and flying range will be specifically studied"

In April of this year announcement

Colonel Kingsford-Smith arriving at Rome, on his England-Australia Flight

Captain Hawks arriving at Roosevelt Field, Long Island, N. Y., from Havana, Cuba

of a transatlantic attempt was first made "Sometime in July" was the schedule chalked on the board Then in July it was decided to make the try in August, and in August it was announced that the venture would not be made until 1931.

But this postponement was shortly retracted after satisfactory tests were made with the plane carrying twelve Curtiss Conqueror water-cooled engines in place of the original twelve air-cooled Siemens Jupiters The new plants raised the horsepower from 6,300 to well over 7,000 and the cooling problem presented by the six pusher engines was obviated with the use of water-cooled system "We will take off in November," said the officials

Thus, after several delays to insure good weather, the giant Do X was flown at Altenrhein, Lake Constance, on November 5 manned by a crew of sixteen The first leg of the long journey was completed 5 hr 40 min later when the seaplane dropped to a landing on the Zuyder Zee at Amsterdam, cheered by throngs of Hollanders who lined the banks Chief Pilot Horst Merz and our own Lieut Clarence H Schildhauer acting as second pilot had taken the flying yacht from Lake Constance directly to the Rhine, up the famous river to the point most adjacent to Amsterdam, then cross-country to their goal The trip had been without incident except for heavy rain in two sections The speed had averaged 98 m p h to 102 m p h, with average r.p.m of 2100 Gross weight for this initial leg was set at 46 tons First reports stated 4 400 gal of benzol fuel were carried but a later report put the figure at 5,283 gal No passengers were taken to Amsterdam because of the added risk of the overland diving.

Next day, November 6, plans were laid for flight of the second leg to Calshot, near Southampton, England, on November 8. Maurice Dornier, brother of the designer, Dr Claude Dornier, stated at this time that Bordeaux, France, would be the next stop after Calshot Bordeaux taking the place of Havre first listed. Thus the route to New York read Amsterdam, Calshot Bordeaux France Coruña, Northern Spain Lisbon Portugal, Horta, Azores, a tankship lying some 700 mi southeast of Bermuda (for refueling), Bermuda, New York Estimated length of the runs were 10 hr from Lisbon to the Azores, 12 hr to the tankship 6 hr to Bermuda, and 7 hr to New York. This means a 35-hr flying time, Lisbon-New York However, ample time for full checking will be taken at the various stops with a particularly close check of the plane and engines at Lisbon prior to the first Atlantic leg The plane will spend the winter in America

Bad weather, at either Amsterdam or Calshot, prevented the flight to England until November 10. In the meantime a guest flight was made over Amsterdam and hundreds visited the giant as she lay in the Zuyder Zee So great was the enthusiasm of the visits that the crew was divided into two harbor watches—and they had their hands full, from all reports

On November 10, then, the Dornier flew from Holland, carrying a crew of 15 and 21 passengers The seaplane weighed some 50½ tons on this occasion, with fuel accounting for some eleven of those tons Three hours and 51 min later she alighted at Calshot, the run having taken the craft down the coast to Ostend, across the Channel to Dover, and south along the coast to Calshot. A slight mishap had occurred at the start when one of the metal straps fitted to the cylindrical oil tanks broke loose but this was soon repaired, and the second take off from the waters of the Zuyder Zee proved successful

It is, incidentally, interesting to note the crew carried Besides Comdr. Friedrich Christiansen there are first and second pilots, a chief engineer an electrician, a naval officer for water command a radio man, an aerodynamical engineer five mechanics, Brewton and Cody Curtiss-Wright engineers, and Dornier plant representatives

The Do X has control rooms, engine compartments, double decks, smoking room, and bar The engines are fully cared for by the engineering crew. thus there is a division of labor, the pilots needing only to fly the craft. With twelve engines, any two may be cut out without hampering flight, and each plant is readily accessible There are two throttles on the bridge, one for each bank of six engines, while the chief engineer in the engine room has individual throttles at hand

✦ THE most recent flight by Captain Hawks was his 8 hr 44 min trip from Havana, Cuba, to New York City on Nov 9 There have been several quick hops chalked up of late by Hawks in his J6-9 Special Travel Air low-wing "Texaco 13," the same plane in which he established the cross continent Los Angeles-New York record of 12 hr. 25 min. 3 sec. and earlier the New York-Los Angeles mark of 14 hr 50 min. 43 sec.

On the first of October, Hawks flew from Detroit to New York in 2 hr. 41 min, on Oct. 7 he flew from Boston to the Curtiss Valley Stream airport at New York in the lightning time of 53 min for the 190 mi run, next day Oct 8, he traveled from Camden Airport, Philadelphia, to Curtiss Airport, Valley Stream, in only 20 min, bringing pictures of the last World Series game to New York, and on Oct 21 he flew from Washington to New York with the time of 63 min for the 225 mi trip, after having flown down from New York in 71 min.

Following these ventures, Hawks said "The transcontinental flights and the minor trips were made to demonstrate the feasibility of Texaco 13 as a high speed ship. I now propose to fly to Havana in an effort to prove further that this plane and other fast aircraft can be profitably adapted to commercial light express work." The record standing at that time for the New York-Havana run was held by Wilmer Stultz, deceased, who flew non-stop to Havana with Charles Levine and Mabel Boll in March, 1928 The mark he set was 14 hr, the plane was the veteran Bellanca Columbia.

Hawks planned to make the Havana flight at some 1,400 mi with two short stops for fuel, one at Columbia, S. C. and the other at Miami, Fla. He hoped to make the trip in the neighborhood of 7 hr With the flight under way, however, he decided against the Columbia pause and flew on to Jacksonville, Fla, where the first stop of the flight consumed 23 min Next he made Miami, stopping 20 min, then continued to his goal The flight took 9 hr 21 min., or 8 hr 38 min actual flying time. It was flown on November 6

He planned to return November 8, but bad weather held him up. On November 9, however, he got away to connect New York and Havana with the fastest of runs—35 min better than his trip down With a stop at Miami of 15 min, and one at Charlotte, N. C., of 26 min, Hawks established a mark of 8 hr 44 min, or 8 hr 3 min actual flying time. He had flown from Havana to Miami in 1 hr 33 min, from Miami to Charlotte in 3 hr 40 min, and from Charlotte to Roosevelt Field, New York, in 2 hr. 50 min. Hawks estimated his average speed at about 195 m.p.h "I have not been punishing my plane," he said, "but instead have utilized its high cruising speed to establish these marks"

✦ ANOTHER flight which attracted interest during the month was that of Capt Roy W. Ammel, Chicago broker, who operates the "Blue Flash" a supercharged Wasp powered Lockheed of the Sirius type but with a somewhat longer span Captain Ammel took off from Floyd Bennett Field, Barren Island

New York, on November 9, and flew non stop to France Field Panama Canal Zone, in 24 hr 35 min. This was the first non-stop New York-Canal Zone flight since the other non-stop ventures from the United States have begun in Florida. The course he flew was Washington, D C, Virginia, Florida, tip of Cuba, Central America, Canal Zone

The object? "It has no object," said Ammel, "I just wanted to come to Panama, I used to live here, you know" Nevertheless, the flight may be said to illustrate the possibilities of carriage by air to the Canal Zone. The distance from New York is set at 2,231 mi by Rand McNally & Co, though Ammel stated he was blown far off his course by a Carribean Sea storm which, he estimated, brought his trip to 3,198 mi

Carrying in the neighborhood of 700 gal of fuel, Captain Ammel had some difficulty at the take off in keeping his heavily-loaded machine on the Bennett Airport 4,000 ft east-west concrete runway Nevertheless, he lifted nicely after a run of somewhat more than half the length of the runway

Captain Ammel came to New York last September to arrange a solo flight across the Atlantic in his "Blue Flash" Poor weather curbed this idea, whereupon the Captain turned about and flew south to the Canal It is said he plans a non-stop flight back to Chicago

✦ Considering records of the month, there are the usual collection of flights In the category record field, we again find Lee Shoenhair's name in the news On October 27, the Goodrich company pilot flew his Wasp powered Lockheed "Miss Silvertown" at an average of 164 26 m.p.h. over a 1,000 kilometer (about 625 mi) triangular course at Akron, Ohio The time was 3 hr 46 min. 59 sec Signed statements covering the performance are in the hands of N A A officials, since 164 26 m.p h bettees the average of 154.293 m.p h established for a world record set by Fernand Lasne, of France, in a 500 hp Hispano-Suiza Nieuport-Delage, August, 1925, at Etampes, France

✦ Word, moreover, has been received that the mark of 164 4319 m p h set by Leroy Manning Ford company pilot, on September 29 has been accepted by the F A I for the multi-engined plane record over a 100 kilometer (62.3 mi.) closd course carrying a 2 000 kg (4,409 lb) load Manning established his mark in a new high-speed Wasp-engined Ford His mark exceeds that of 142.66 m p h set by W J Fleming in a Bach tri-engine at Los Angeles in March, 1930 Manning's time for the course was 22 min 40 4 sec

✦ Turning to the junior-flier field, we record that Stanley C. Boynton, 18-yr old Lexington Mass pilot, now claims the junior cross-continent mark in both directions Boynton flying a J6-9 Cessna plane, flew from Rockland, Me., to Los Angeles in 24 hr 2 min He landed at Los Angeles November 1 A few days later he flew back to Rockland in 20 hr 29 min., terminating his flight November 9 Both times bettered those of the previous junior record holder, Robert Buck, of New Jersey

✦ In the glider field, the N A A announces two American engineless-flying records The first is the American duration record of 6 hr 48 min. credited to Jack O'Meara for his flight in his Cadet II during the Elmira competition, September 30 The second is the American altitude record bearing the name of Warren Eaton, who flew his Cadet II to a height of 3,159 ft. on October 10

✦ In the sphere of feminine flying, a new coast-to-coast woman's mark was established in a Wright J6-5 Eaglerock Bullet by Mrs Keith Miller, who flew from Los Angeles to New York in 21 hr 47 min, landing on the East Coast on Oct. 26. She now holds the round-trip record, having flown from New York to the West Coast a short time before in 25 hr 44 min Her west east mark betters the former record of Miss Laura Ingalls by 3 hr 48 min, while that for the east-west run is 4 hr 44 min faster than Miss Ingall's time The marks may be compared with those of Mr Boynton recorded above

Other women in the news during this period were Miss Marion Eddy and Miss Alicia Patterson Miss Eddy flew a Savoia-Marchetti, S-56 amphibion to an indicated altitude of 14,500 ft. Her barograph has been sent to the N A A for calibration Miss Patterson flew a Wright powered Laird biplane from Cleveland to Curtiss Field, Valley Stream, N Y, in 2 hr 49 min on November 7 Miss Patterson plans to go after Mrs Miller's records in 1931

✦ Outstanding in the way of meets was the All-Eastern States Air Races at Mercer Airport, Trenton, N. J., October 18-19 Nearly 200 planes were on hand, though only a small number of them took part in the aerobatics and races The affair was quite successful, though badly marred by the death of Richard W Mackay and George Zinn whose planes collided in mid air The races were sponsored by the American Legion, which was raising money for the Cathedral of the Air planned to be erected at Lakehurst as a memorial to aviators.

✦ Sportsmen pilot meets are of high value in forwarding the private flier angle of the industry Some weeks ago such a meet was held by the Long Island Aviation Country Club while a meet somewhat similar was offered privately by R B Snowden, Jr, Command-Aire president, at his private field near Memphis A third was held on October 18 at Pal-waukee Airport, Chicago

Many meets too, were held on Navy Day, October 27 At Mustin Field Philadelphia Navy Yard, the Noel Davis Trophy, awarded to the Naval Reserve considered to have done the most efficient work, was given to the Philadelphia Naval Reserve Squadron.

Capt Roy Ammel in the cockpit of his Detroit Lockheed

✦ Among competitions planned at this writing is the annual speed contest for the Army fliers at Selfridge Field Mich, November 22 Pursuit pilots will fly for the John L Mitchell Trophy in the eighth contest for this award The record is held by Lieut Cyrus Betts who averaged 175 43 m p h in this event In 1924 The race has usually been run at the National Air Races, but this year wast postponed until the present. The last three winning averages have been 158 412, 154 743, and 152.17 m p h The times seem to be getting slower

The next most important air race meet is scheduled at Miami, Fla., Jan. 8-10—the Third Miami All-American Air Races. Reports say that 140 planes have already been signed. A race of three Autogyros is one of the events

FOREIGN EVENTS

The Court of Inquiry into the R 101 disaster of Oct 5 has been the center of much aeronautical attention in recent weeks The court was convened on October 28 and continued through November 10, when proceedings were adjourned to December 3 to permit the court ample opportunity for study of data already submitted

The Committee is seeking answer to the following six questions.

1 Did the experts really consider the R.101 safe?

2. Do independent experts consider that the airship was given sufficient trials before starting on her last voyage?

3 Was she carrying sufficient ballast at the start of her journey or was she forfeiting water ballast for additional fuel, intending to collect rain water to make up ballast as she went along?

4 What was her maximum safety loading, and what was her actual loading when she slipped from the mast at Cardington?

5 If there were any irregularities in the loading of the ship did the crew know about them?

6 Who was actually responsible for ordering the start of the flight?

It is still too early to draw any definite conclussions from the testimony so far heard A number of interesting statements and comments have been made, however, which merit consideration

The theory has been advanced in some quarters that rats may have invaded the interior of the airship and been responsible for holes in the balloonets, permitting hydrogen to escape The airship station is said to have been rat-ridden and J H. Binks, a survivor of the crash has reported seeing large rats swarming through the airship wreckage while it was still burning

Squadron Leader F S Booth, commander of the R.100 on her Canadian flight, has asserted through a representative that the trial flight of the R 101 was not sufficiently long and thorough This trial, which followed the insertion of the new 35-ft. center section, was shortened from 24 hours to sixteen, and during that time one of the reversing engines stopped completely while the other gave trouble The facts that a full speed trial under a wide variety of conditions was not given and the time cut short are significant

Testimony of the survivors has been extremely harrowing All seem to agree that the airship made two sharp dives, the crash coming at the end of the second dive.

Mr Binks has stated that the airship did not leave the mast on an even keel but seemed to be heavy at the stern, necessitating the release of three water ballasts Air Marshall Hugh Dowding testified he ordered Wing Commander Colmore, one of the victims, to give the airship a full power test as soon as possible after it had left the mooring mast on its last flight Apparently, this order was ignored

It has been brought out also that in June inspectors discovered a number of bad leaks in the hydrogen bags These leaks were caused by friction between the internal bracing wires and the bags. Apparently the only repairing done was to provide padding at the friction points a superficial handling of the condition

Earlier comments to the effect that a possible premature departure of the airship followed a desire to stage a good show for the benefit of the Imperial Conference seem to be borne out by more recent observations This is a serious indictment.

As a result of this disaster, the Howden airship station is being closed down and there is little likelihood that any airship building will be instituted for a number of years at least Tuning up of the R.100 has been postponed indefinitely

✦ National Flying Services, Ltd., the British company organized in April, 1929, to operate light plane clubs and engage in miscellaneous air taxi, aerial photography services, etc., recently reported a loss of $196,410 for the first year Only $3,700 was earned under the government subsidy though the maximum allowed was $25,000 Steps have been taken to raise fresh capital

Unfavorable factors included extremely poor flying weather and the industrial depression None of the directors has drawn fees, the management has voluntarily accepted salary cuts, staff reductions have been made, and flying charges have been increased

Planes flew 13,000 hr membership of the clubs total 1 637—912 of whom are flying members, 229 hold pilot's licenses—and 52 have bought planes

✦ In any outstanding flying achievement mention should be accorded the machine as well as the man or men involved The spectacular flight made by Kingsford-Smith from England to Australia in ten days, was made in what is called the Long Range Avro Avian, built specifically for him for that particular flight It is the latest product of a notable line which was started by the Avian used by Bert Hinkler when he made his notable flight from England to Australia in 15½ days in 1928 and whose record Kingsford-Smith has just broken

The plane had a range in still air of 1 860 mi. and an average cruising speed of 92 m p.h at 1,900 r.p.m Additional wing area over the standard model was secured by increasing the span from 28 to 30 ft The standard welded steel Avian fuselage was used though certain members were strengthened to stand higher loading A standard Avian undercarriage was fitted and standard tail surfaces and engine mounting were used The regular 24-gal center section tank was installed but the front seat was eliminated, providing space for an aluminum tank holding 91 gal of fuel It was fitted with a De Havilland Gypsy engine of 110 hp at 2,000 r p m

The gross weight of the plane was 2 225 lb Its minimum speed near the ground 50 m p h Its endurance at 94 m p.h is 20 hr Its service ceiling is 10,000 ft. Its wing loading is 9 5 lb per square foot and its normal power loading is 20 2 lb. per horsepower

The giant Dornier Do-X taxiing on Lake Constance

✦ Deruluft, the Russian-German company operating the airline between Moscow and Berlin, carried 2 860 passengers during the season just closed This is an increase of about 12 per cent over 1929.

✦ Subsidy arrangements for the Cairo-Cape Town mail and passenger service to be operated by Imperial Airways have been announced About half of this route will be opened in January and the balance in April, according to present plans. The subsidy goes into effect when the complete service has been established

The government will allow a maximum of $4,700,000 to be spent over a period of five years This will range downward from a possible total of $1 200,000 the first year to $600,000 the last year Of the total amount, however, $3,350 000 will be supplied by the Individual African governments through whose territory the route lies This leaves only about $1,350 000 for the United Kingdom to contribute

✦ The second series of safe flying prizes awarded by the French Committee of Aeronautical Propagenda was announced October 15 The awards go to commercial airline pilots flying the greatest distance without mishap First prize was awarded to a pilot of the Compagnie Generale Aeropostale who flew 49 000 mi between February 1 and July 31 without accident

✦ In an effort to secure a standard parachute for general use throughout France, the French Air Ministry will hold early in 1931 an international parachute competition Entries must be made by December 15 and exhibits must be submitted by noon on December 31 The entry fee is $195

Not more than three models will be accepted from any one exhibitor All the entries will be drop tested and three classes of prizes will be awarded The contestants must agree in advance that the successful company will construct or have constructed by third parties all or part of the parachutes or equipment under a license to be given the French government If the government avails itself of this right, it agrees to pay royalties of 6 4-10 per cent of the value per unit manufactured The prizes total about $15,000

Statistics of the Month

Material supplementing the statistical issue AVIATION, March 29, 1930, appears regularly each month. Page numbers in the statistical issue are given

LICENSING DATA

(Pages 640 561 and 568) Chapter Periodic Airplane License and Identification Data, October 25, 1930

Licenses valid	6,984
Identification valid	2,325
Total	9 209
Ratio of licensed aircraft to total	0 753
Glider licenses and identifications valid	981

Periodic Pilot and Mechanic License Data, October 26, 1930

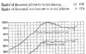
Airplane pilot licenses valid	14 884
Glider pilot licenses valid	146
Mechanic licenses valid	9 042

New Airplane and Glider Pilot Licenses Issued during October, 1930

Private	550
Industrial	1
Limited commercial	24
Transport	24
Glider	29

Relation of Licensed and Identified Planes, Pilots and Mechanics October 25, 1930

Ratio of licensed pilots to total planes	10 467
Ratio of licensed mechanics to total planes	0 976



Aircraft and glider licenses and identifications

QUARTERLY LICENSE DATA

Due to the large increase in the number of renewal licenses included in the license list each week, it has been found advisable to make a new tabulation of only those planes which have been licensed for the first time, not including changes from identifications to licensed aircraft. However, due to the fact that this differentiation between newly licensed planes and planes transferred from identifications or relicensed was not made until after the fifteenth of January the data for the first quarter of 1930 will be short two weeks. The breakdown of all planes licensed including relicenses and changes from identified to licensed planes for the first and second quarters of 1930 was published on page 128 of the September issue and for the third quarter on page 262-3 of the November issue of AVIATION. We present herewith the new breakdown of new planes licensed for the first time. These planes have never been licensed or identified before.

The five largest manufacturers received 48 per cent of all licenses granted during the first part of 1930 and 38 per cent of all licenses granted during the third quarter of 1930. These same five manufacturers received 50 per cent of all new licenses granted during the first half of 1930 and 62 per cent of the licenses granted during the third quarter of 1930.

The ten largest manufacturers taken together received 68 per cent of all licenses granted during the first half of the year and 78 per cent of the licenses granted during the third quarter of the year. These same ten manufacturers received 71 per cent of the new licenses granted during the first half and 71 per cent of the new licenses granted during the third quarter of 1930. Thus we find that the ten largest manufacturers receive only a slightly lower portion of new licenses granted than they did of all licenses issued.

A new breakdown has been made of engines used in planes licensed for the first time. Foreign engines accounted for 27 per cent of all engines used in the complete list of licensed aircraft. However, they only account for approximately one per cent of the engines used in planes licensed for the first time. War surplus engines accounted for 13 per cent of the engines used during the first nine months in newly licensed planes. Five manufacturers account for 63 per cent of the domestic engines used and 70 per cent of the total number of engines used in all newly licensed planes.

New Licenses Granted During 1930

(Planes never licensed or identified before)

	First Quarter	Second Quarter	Third Quarter	Total
Aeromarine Klemm	1	7	9	17
Aeronca	0	0	4	4
American Eagle	15	27	28	70
Arrow Sport	2	0	0	2
Brunner-Winkle Bird	5	17	37	59
Boeing	2	0	1	3
Cessna	4	2	2	8
Command-Aire	4	4	8	16
Curtiss-Robin	10	18	4	30
Eaglerock	8	9	7	24
Fairchild	74	17	10	51
Monoplanes	*3*	*1*	*0*	*8*
KR	*27*	*16*	*8*	*48*
Fleet	14	47	42	103
Fokker	7	4	4	15
Ford	3	5	5	13
Great Lakes	8	17	25	50
Keystone-Loening	7	7	12	26
Lincoln	12	9	3	24
Lockheed	3	8	8	19
Moth Aircraft	11	27	37	75
Cabin types	*6*	*28*	*33*	*67*
Open types	*5*	*6*	*4*	*74*
Moth	53	22	4	59
Nicholas Beazley	0	4	3	7
Parks	2	0	3	5
Pitcairn	5	8	4	17
Ryan	9	5	1	15
Savoia Marchetti	10	4	7	21
Sikorsky	7	3	7	17
Spartan	14	6	8	20
Stearman	8	4	9	21
Stinson	14	30	122	195
Swallow	4	1	3	8
Travel Air Mfg. Co	29	15	28	72
Biplanes	*28*	*70*	*27*	*52*
Monoplanes	*7*	*2*	*7*	*70*
Waco	36	47	168	181
Miscellaneous	58	46	62	166
Total	367	447	605	1 413

Type Trend of Newly Licensed Planes

We are presenting herewith a breakdown of newly licensed planes by types. From this tabulation, it will be seen that 64 per cent of the total aircraft licensed during the first three-quarters of 1930 are biplanes. Open cockpit planes are still in the lead accounting for 60 per cent of the total newly licensed aircraft.

Engines in Planes Licensed for First Time

	First Quarter	Second Quarter	Third Quarter	Total
Aeronca	0	0	4	4
Axelson	2	0	4	6
American Cirrus	8	17	26	51
Comet	0	1		1
Curtiss	12	9	5	26
Hess Warrior	1	0	0	1
Kinner	48	112	122	302
Lambert Velie	12	32	35	79
Le Blond	6	12	10	28
Lycoming	2	55	108	165
P & W Hornet	9	9	7	25
P & W Wasp	33	22	34	89
Wright Cyclone	1	0	1	2
Wright Gipsy	33	22	7	62
Wright Whirlwind Series	92	83	72	227
Warner Scarab	5	25	94	124
Miscellaneous	1	4	10	15
War Surplus Engines				
Hisso	9	14	1	24
Liberty	0	0	0	0
OX5	47	43	55	145
OXX6	6	2	6	14
Foreign Engines				
DH Gipsy	1	1	0	2
Siemens-Halske	2	1	0	3
Walter	1	0	0	1
Miscellaneous	1	4	4	9
Total	361	447	605	1 413

Land planes constitute 89 per cent of the licensed aircraft, while convertible planes, i.e. available for use as either land planes or seaplanes, account for 4.8 per cent of the total number of planes. Amphibians account for the same percentage as convertible planes. Flying boats and seaplanes constitute only 2 per cent of the total aircraft licensed.

	First Quarter	Second Quarter	Third Quarter	Total 1930
Biplanes	258	270	365	893
Open cockpit	*237*	*263*	*340*	*840*
Land planes	222	225	327	774
Seaplanes	0	0	0	0
Amphibians	9	4	7	20
Flying-boats	6	4	5	15
Convertible*	0	30	7	37
Cabin	*21*	*14*	*26*	*61*
Land planes	4	2	2	8
Seaplanes	1	0	0	1
Amphibians	16	11	15	42
Flying-boats	0	0	0	0
Monoplanes	103	171	262	536
Open cockpit	*13*	*20*	*38*	*71*
Land planes	13	29	29	71
Seaplanes	0	0	0	0
Amphibians	0	0	0	0
Flying-boats	0	0	0	0
Cabin	*90*	*148*	*212*	*448*
Land planes	69	131	205	405
Seaplanes	0	0	1	1
Amphibians	0	0	4	4
Flying-boats	3	5	1	7
Convertible*	18	0	2	20
Total	361	447	605	1,413

*Convertible from landplanes to seaplanes.

TREND OF AIRPLANE TYPES

Fig. 1

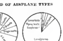


Fig. 2

Fig. 3

Fig. 4

A numerical study of the approved type certificates granted to airplanes and engines during the first nine months of 1930 is herewith presented as an index of the trend of airplane and engine design types. The first logical division is that of monoplanes and biplanes. Monoplanes have been in ascendency for the past year and a half and account for sixty-one per cent of the approved type certificates in the present break-down as compared with a figure of thirty three per cent for the first quarter of 1928. A further break-down of the monoplanes and biplane groups of the present period is presented in the tabulation herewith.

The proportion of one, two and three engined planes has remained approximately the same as that of a year ago. Single engined machines account for ninety-one per cent of the approvals. Fig. 1 shows a break-down of the years approved type certificates on the basis of seating capacity which to some degree is an indication of the classification according to weight range. Two-seater biplanes amount to twenty seven per cent of the approved aircraft which is approximately

bution of Aircraft, Gliders, Pilots, Glider Pilots and Mechanics, by States, Sept 30, 1930

	Aircraft: Licensed	Identified	Total	Gliders	Pilots: Transport	Limited Commercial	Industrial	Private	Total	Glider Pilots	Mechanics
Alabama	19	20	39	3	31	3	1	15	50		40
Arizona	21	9	30	1	20	14		52	86		57
Arkansas	45	13	58		37	21	1	69	177		57
California	912	170	1 082	187	1,000	228	30	1 427	2,685	45	1,663
Colorado	40	25	75	100	56	53		56	145		76
Connecticut	104	23	127	6	53	31		78	162		130
Delaware	33	9	42	1	7	4		13	24		16
District of Columbia	55	6	61	7	190	9		74	273	6	142
Florida	77	31	108	6	158	33	1	104	288		279
Georgia	29	29	58	1	35	4		25	64	1	44
Idaho	9	8	17	4	12	6		11	29		29
Illinois	404	101	585	40	321	152	18	360	851	13	550
Indiana	145	89	214	27	109	40	1	137	293	3	144
Iowa	112	42	154	12	76	51		107	229	2	139
Kansas	203	137	537	49	126	44	2	109	281	2	191
Kentucky	59	12	51	7	32	19		31	82		41
Louisiana	75	13	90	1	34	15		34	85		65
Maine	19	11	30	1	26	10		30	64		21
Maryland	57	20	77	11	51	25	2	67	145		109
Massachusetts	176	30	206	10	142	63	2	229	436	1	205
Michigan	354	106	460	117	761	102	3	206	662	11	443
Minnesota	92	52	144	8	80	46	1	104	240	2	151
Mississippi	22	7	29	1	15	7	1	27	50		16
Missouri	287	85	372	13	720	85	4	179	408	1	275
Montana	34	31	85		24	11		36	71		51
Nebraska	109	98	307	6	71	25		101	197		128
Nevada	8		8	2	3	2	1	5	11		18
New Hampshire	22	4	26	3	12	9		23	44	3	19
New Jersey	177	87	264	79	122	40		197	359	5	380
New Mexico	14	4	18	2	13	6		19	38		16
New York	949	170	1,119	94	402	219	14	893	1,680	5	679
North Carolina	40	37	70	4	24	15		7	46		45
North Dakota	31	32	63	4	25	10		23	58		26
Ohio	340	181	521	82	311	143	1	309	764	13	510
Oklahoma	222	93	315	7	176	53	4	147	380		156
Oregon	61	51	117	5	74	22		58	154	1	106
Pennsylvania	390	75	465	27	211	135	8	347	699	1	408
Rhode Island	30	6	36		10	7		24	41		20
South Carolina	12	26	38	2	23	7		14	44		10
South Dakota	53	15	68	9	50	21		40	99		46
Tennessee	55	24	82	5	50	16		51	175		70
Texas	305	71	376	14	381	67	7	267	722	2	496
Utah	28	8	36	3	50	4	0	20	74		62
Vermont	14	3	17		10	9	1	6	20		10
Virginia	30	17	67	7	134	18	1	40	193		266
Washington	139	39	178	5	116	54	1	110	281		182
West Virginia	24	10	34	3	19	16		25	60		25
Wisconsin	156	55	211	17	96	52	1	126	275		101
Wyoming	29	8	37	3	15	5		13	31		63
Alaska	11	5	16		5	3		8	14		15
Canada					4	3		9	16		8
Canal Zone		2	2		59	1		1	41		60
Central America											
Cuba	2		2								
Hawaiian Islands	6	1	7		37	1		9	47		98
Mexico		1	1		12			6	18		5
Philippines					9				9		3
Porto Rico	1		1		4				4		
Foreign miscellaneous					17			12	29		28
Total	6 655	2 230	8 893	977	3 744	2,003	98	6,610	14 425	110	8,979
Percentages					39 61	13 09	0 68	45 82	100		

There has been quite a decrease in the total number of licensed and identified aircraft since June 30 according to a statement recently issued by the Department of Commerce, as of September 30. Complete tabulation is given herewith. However the total number of aircraft pilots has shown a pronounced increase while mechanics' licenses have remained approximately the same.

New York is first on the list of licensed or identified aircraft and California has the largest number of pilots, mechanics, gliders, and glider pilots.

the same as it was at the end of 1928 but a considerable decrease is noted in the numbers of three-seater planes which have been so popular in the past. From 40 per cent in 1928 they have decreased to 23.9 per cent for the first nine quarters of 1930. There has been somewhat of an increase in single place planes and for the present year, these constitute 9.5 per cent of the approved type certificates. A comparison with the analysis of approved type certificates for 1929 which appears in AVIATION, issue of Feb. 15, 1930, shows that there has been a large decrease in the six and seven passenger plane groups as well as in the planes carrying more than ten passengers.

Land planes constitute a total of eighty-seven per cent of the approvals issued the remainder being divided among the other types as shown in Fig. 2.

Engines

Examining the engines approved during the first nine months of 1930, we find thirty-two per cent of the approvals in the 61 to 100 hp range and an equal proportion in the 101 to 350 hp. range. This together with the status of the other horsepower ranges is presented in the chart Fig. 3. Comparison with the previous analysis shows large increases in the 61 to 100 hp and 101 to 350 hp. ranges, as well as a slight increase in the lower horsepower range 10 to 60 hp. Pronounced decreases in the number of approvals in the 351 to 700 hp. and 301 to 600 hp. ranges also are noted.

In the 1930 break-down of engines with respect to a number of cylinders (Fig 4) we note that twenty-four per cent of the approvals have been issued to four-cylinder engines. This is a very pronounced increase as compared with 1929 in respect to popularity of the vertical and inverted in-line type. Five-cylinder engines show approximately as much increase as that of the four-cylinder types and the advances in these two groups seem to have been made at the expense of the seven-cylinder class, of which there are but sixteen per cent as compared with approximately thirty-one per cent in 1929. The popular nine cylinder group remains about the same as last year while the twelve and eight-cylinder classification seem to have disappeared. Four per cent of the approved engines were of the three-cylinder type. Sixty-eight per cent of the approvals of 1930 were issued to radial engines while most of the remainder are devoted to the in-line type.

This analysis is based on eighty five aircraft approvals issued during the first nine months of 1930 and twenty-five engine approvals of the same period.

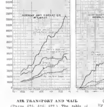
Classification of Approved Aircraft by Types

Biplanes

Open land planes	27
Open amphibions	3
Open flying boats	2
Cabin amphibions	1

Monoplanes

Open landplanes	12
Open amphibions	1
Cabin landplanes	35
Cabin seaplanes	2
Cabin amphibions	1
Cabin convertible	1
Total	85



AIR TRANSPORT AND MAIL

(Pages 676, 676, 677) The table of July and August air mail operations appear herewith. Cumulative totals for the first eight months of 1930 are

Total miles scheduled	11 106,444
Total miles flown	10 502 949
Pounds of mail carried	5 233 156
Amount paid to contractors	$9 436 400
Total number of trips scheduled	17 810
Average rate per scheduled trip	305
Average compensation per mile flown	$0 899
Average compensation per pound carried	$1 803

(Page 679) Contract air mail regularity (Percentage mileage flown in of mileage scheduled),

August 96 6%

(Page 674) Airway and Operation Mileage October 31 1930

Miles of mail airways	35,611
Total miles of airways	47 104
Miles scheduled daily with mail	38 896
Total miles scheduled daily	125,771

(Page 676) Percentage of total route mileage on which mail is carried

October 1930 .... 70 2%

AIRPLANE ACCIDENT REPORT

	January-June 1930	January-June 1929
All kinds of flying		
Total miles flown	68,649,926	56,261 350
Fatal accidents	150	127
Miles flown per fatal accident	457,666	442 530
Total accidents (fatal non-fatal and non-injuries)	950	774
Miles flown per accident	73 859	72,612
Scheduled air transport		
Total miles flown	16,902,728	9 201 550
Fatal accidents	6	6
Miles flown per fatal accident	2,817,121	1,022,571
Total accidents (fatal, non fatal and non-injuries)	44	61
Miles flown per accident	384 152	150 842
Miscellaneous operations		
Total miles flown	51,767 200	47 060 000
Fatal accidents	144	118
Miles flown per fatal accident	359,494	398,305
Total accidents (fatal and non-fatal and non-injuries)	906	715
Miles flown per accident	58,427	65,919

The number of miles flown per accident in civil aeronautics for the United States for the first six months of 1930 show a slight increase over the same period for the previous year, according to a report of aircraft accidents published by Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

The reports on scheduled air transport operations show that the number of miles flown per fatal accident in this type of service increased almost three-fold while the miles flown per accident of any kind in scheduled flying more than doubled.

It is shown that the total miles flown per accident in miscellaneous operations has decreased 11 4 per cent for the first half of 1930 as compared with the first half of 1929.

From the standpoint of mileage flown per accident of any kind in all classes of civil aircraft operations and for all classes of accidents throughout the United States for the first half of 1930 the reports show a total of 960 accidents, which placed the total mileage per accident at 74 639 miles. For the first half of 1929, there were 774 accidents of all kinds, and a total mileage of 72,612 miles per accident for all classes of operation.

The largest percentage of accidents was attributed to personnel the total being 47 1 per cent. The next largest percentage was charged to miscellaneous, which amounted to 17 7 per cent. Power plant failures contributed 16 per cent and airplanes failures 8 6 per cent. In the miscellaneous class airport and terrain was charged with 6 7 per cent, weather with 8 6 per cent, darkness 1 per cent. The percentage of undetermined and doubtful causes was 1.4 per cent, the smallest percentage for this transportation since these statistics have been compiled.

Air Mail Statistical Report for July 1930

Route— Number and Terminal	Length of Route (Miles)	Through round trips Scheduled	—Miles of Service— Scheduled	Actually Flown	Total Weight of Mails Dispatched (Pounds)	Amount Paid to Carrier
1 Boston-New York	200	26	18,600	18,600	11,419	$14 820 40
2. Chicago-St. Louis	276	62	34 224	54 224	5 166	21 965 92
3. Chicago-Dallas	1 076	62	125,984	125,984	38,882	108,738 29
4 Salt Lake City-San Diego	771	31	88,164	88 044	71 292	96 551 55
5. Salt Lake City-Seattle (a)	1 028	31	109,577	109 205	51,216	91,628 05
8. Seattle-San Diego (b)	1,238	51	72,318	72 318	25,001	58 156 01
9. Chicago-St. Paul (c)	464	93	93,334	90 329	21,230	50 302 41
11 Cleveland-Pittsburgh	123	62	25375	25 252	5 150	15 407 31
12. Cheyenne-Pueblo	199	51	12,623	12,392	8 390	6 963 38
16. Cleveland-Louisville	345	31	23 062	23 062	7 506	9 255 52
17 New York-Chicago	716	62	116,629	116 516	152,722	122 724 20
18. Chicago-San Francisco	1 932	56	225 429	224 796	167 656	544 542 24
19 New York-Atlanta	790	62	109 914	105 926	59 229	112,657 04
20. Albany-Cleveland	446	27	24 084	24 090	6,180	6,659 94
21 Dallas-Galveston	320	31	19 840	19 840	3,204	9260 64
22. Dallas-Brownsville	529	31	52 798	52,796	7 649	22,105 97
23. Atlanta-New Orleans	483	31	29 946	29 946	9 725	17 018 97
24 Chicago-Cincinnati	270	62	34 638	34 850	7 606	11 100 18
25 Atlanta-Miami	754	31	46 965	45 850	14 741	21,521 40
26 Great Falls-Salt Lake City	489	51	46 680	46 690	7 035	17 404 20
27 Bay City-Chicago	924	26	66 692	64 692	10 102	16 110 50
28. St. Louis-Omaha	404	62	50,076	50 096	17,557	13 762 29
29 New Orleans-Houston	319	51	19 778	19 699	4 465	4 464 94
30 Chicago-Atlanta	760	31	61 380	61 300	10 960	6 546 92
Totals	15 058	1 036	1,405,728	1 478 267	692,467	$1,214 676 85

(a) Route C.A.M 32 consolidated with route A.M 5 effective from July 1, 1930

(b) Route 8 extended from Los Angeles to San Diego effective from July 1, 1930

(c) Western terminus of route 9 stated as St. Paul instead of Minneapolis effective July 1, 1930

Supplemental Payments:	Route 8 May 1930 125 lbs. 3 ozs.	$352 09
	Route 9. April, 1930, 15 lbs 9 ozs.	42 60
	Route 10. June, 1930 545 lbs. 14 oz	1 157 99
	Route 10. March, 1930,	26 51
	Route 22, June, 5 lbs 13 oz	16 50
	Route 25. May, 1930, 5 lbs. 4 oz	7 66
Deductions	Route 10, June, 1930, 10 lbs.	622 50

Correction June Report-Route 26—41,996 instead of 40 796 miles scheduled; 41,984 instead of 40 784 miles flown.

NOTE—Close comparisons between the various air mail reports issued from time to time will reveal slight discrepancies in various figures. These are not errors, strictly speaking but are due to various readjustments which have to be made from month to month after the preliminary figures have been released.

Air Mail Statistical Report for August, 1930

Route— Number and Termini	Length of Route (Miles)	Through Round Trips Scheduled	—Miles of Service— Scheduled	Actually Flown	Total Weight of Mails Dispatched (Pounds)	Amount Paid to Carrier
1 Boston-New York*	200	20	19 200	18 506	6,961	$14 890 75
2. Chicago-St. Louis*	276	62	34,224	34 125	5,590	21 926 03
3. Chicago-Dallas*	1 070	62	126,053	126 053	34 996	109 007 30
4 Salt Lake City-San Diego*	771	51	88 164	88,044	72,026	97 281 60
5. Salt Lake City-Seattle*	1 028	31	109 244	108,539	4 106	91 706 47
8 Seattle-San Diego*	1 238	31	75 764	75,784	24 789	65,554 05
9 Chicago-St. Paul	664	95	90,534	89,948	20 406	56 475 12
11 Cleveland Pittsburgh	123	62	25 621	25 621	5 410	16 229 62
12. Cheyenne-Pueblo	199	31	12 629	12,507	8 805	7 306 18
16. Cleveland Louisville	345	31	23 062	22,973	7 710	9 406 05
17 New York-Chicago	718	62	118 570	118 570	150 660	121 734 08
18. Chicago-San Francisco	1,932	56	227 272	225 310	207 792	342 703 07
19 New York-Atlanta	780	62	109 292	109 223	40 723	122,170 50
20 Albany-Cleveland	446	26	23 192	22,684	5 595	6 206 20
21 Dallas-Galveston	520	31	19 840	19,720	5 379	9,765 67
22. Dallas-Brownsville	529	31	52 798	52,731	7 524	21 743 28
23 Atlanta-New Orleans	483	31	29,946	29,946	10 414	17 699 06
24 Chicago-Cincinnati	270	62	35 570	35 100	7 379	10 647 00
25. Atlanta-Miami	754	31	46 740	46 601	15 451	22,529 26
26. Great Falls-Salt Lake City*	509	31	40,732	40 752	6,542	30,269 57
27 Bay City-Chicago*	888	26	59 764	59 464	17 664	41 604 02
28. St. Louis-Omaha	404	62	50 262	50 262	18 594	14,594 04
29 New Orleans-Houston	319	31	19 776	19 778	4 719	4 719 50
30 Chicago-Atlanta	768	31	61,380	60 621	12,107	9 445 73
	13,042	1 035	1,407 047	1 401 066	779 219	$1,264 012 83

*On space-mile basis of payment.

EXPORTS

(Pages 604 and 608) Detailed export data for August were published on page 5 of the October 4 issue of *The Aviation News*. Cumulative figures for the first eight months of 1930, and for comparison, the first eight months of 1929 together with the percentage of increase or decrease between these two comparative periods are given below

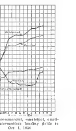
	1930	1929	Difference (Per cent)
Number of aircraft	237	260	— 1 5
Value of aircraft	$3 552,063	$3 965 429	—10 4
Number of engines	255	237	+ 6 5
Value of engines	$1 116,927	$1 029 453	+ 8 5
Value of parts	$1,544 950	$1 475 266	+ 4 7
Total value	$6,214 720	$6,469,870	— 3 8

AIRPORTS

(Page 582) Airport Statement

	Jan 1 1930	July 1 1930	Oct. 1 1930
Municipal Airports	453	508	521
Commercial Airports	495	550	575
Intermediate fields	285	506	324
Auxiliary fields	255	210	294
Government airports	84	81	78
Total Airports	1 552	1 655	1 792

Progress of airport construction during 1930 has been comparatively steady. Commercial airports are increasing but slightly faster than municipal ports. At the present time commercial fields out-



Number of commercial, municipal, auxiliary and intermediate landing fields to Oct 1, 1930

number the municipal airports by 11 per cent after having been approximately 18 per cent behind about two years ago

Auxiliary fields have been steadily decreasing during the past year. However, during July they showed a slight increase in number. Since that time, that is, during August and September, there has been a remarkably rapid increase in the number of the large auxiliary fields. Intermediate fields have been increasing steadily

In California available landing fields form themselves into unofficial airways. Mountain ranges make a blanket system difficult

AMERICA'S AIRPORT PROBLEM TO DATE

Although predictions of four years ago have not come to pass, the development of airports in this country has gone forward at a remarkable rate, even in face of the general slump. However, development is still of a more or less hit-or-miss character which should be substituted at the earliest opportunity by carefully engineered plans.

By Charles H. Gale

Assistant Editor of AVIATION

FOUR years ago it was predicted that by 1931 the country would be dotted with ground facilities for aircraft, enabling pilots to find recognized landing places on every hand and complete terminal facilities at strategic points We have had four years to fulfill these promises. Just what have we accomplished in this construction movement what have been the lessons learned and what program, if any, are we following? Furthermore, just where are we headed in all this building? It has been a mushroom sort of development so far landing facilities springing up wherever there was local enthusiasm. We should expect something in the nature of a national system to be worked out What has become of suggestions, made at regular intervals of months for a definite network of fields blanketing the country?

Not more than half of the proposed airports reported by the Aeronautics Branch of the Department of Commerce during the last four years have ever been recognized by that department as completed However between July 1, 1927, and July 1, 1930, there has been an over-all increase which reflects credit upon the enterprise of the average community and the energy of the builders The government reported in July that there were 1,058 municipal and commercial fields—not including any of the military or airways fields—as compared with about 380 in July 1927 This is a net gain of 678, an average of 226 each year, or about 19 per month

In fact the airport department has been about the healthiest of any connected with aeronautics It has remained the most active in the contemporary period of depression, and in the months preceding the decline valuable, permanent equipment was installed This was premised on the growing appreciation of the ground element of flying The airport has been recognized as a major consideration and it is generally agreed that flying, at least as far as transportation is concerned, is limited and conditioned in the public eye by the extent and quality of our terminal facilities

Thus is in contrast with the war and pre-war concept of flying as a military or exhibition activity The bases for these types of aviation were called merely flying fields and were arranged from the point of view of the operators rather than of the public. Because military exigences and the financial status of the scattered commercial operators limited equipment to the barest necessities, temporary installation characterized most fields.

The term "airport," suggesting an air harbor of commerce, came into use following the war, spurred on by the gradual evolution of commercial flying phases and attendant need for safety, convenience, efficiency, and comfort The development of the contract air mail system in 1926 and 1927 was a tremendous stimulant to the commercial concept, and in 1927 the general burst of interest in aviation added more fuel to the fire. Chambers and Commerce, state governments, municipalities, and private corporations began thinking about airports—most of them for the first time in a serious way

Of course, the enthusiasm for landing facilities four years ago was of much the same stuff as made up the current passion for starting airplane companies and airlines It was impossible that all the glowing pictures painted should prove to be of durable ingredients But there was growth, as is shown by the following table stating the number of recognized fields in operation as of the states given

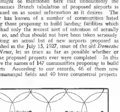
	Municipal Airports	Commercial and Private Airports
July 1 1926	130	185
July 1 1927	180	200
July 1 1928	352	335
July 1 1929	414	420
Jan. 1 1930	453	495
July 1 1930	508	550
Oct. 1, 1930	521	575

The Aeronautics Branch keeps a record also of the airports projected and these have increased steadily For instance, at the close of 1927 there were about 400 projects supposedly arranged for but yet to be undertaken or completed At the close of 1928 there were 894 of these and in July, 1929, there were 1,178

Looking at it in a slightly different way, we find that between July 1, 1927, and July 1, 1929, a total of 1,632 projects had been recorded at Washington as potential airports or landing fields. By July 1 of this year but 678 of these had been completed and recognized in the federal records It is safe to assume that practically all the others had fallen by the wayside, a casualty rate of about 45 per cent

It might be mentioned here that undoubtedly the Aeronautics Branch tabulation of proposed airports is not based on as sound information as it desires The writer has known of a number of communities listed among those proposing to build landing facilities which have had only the merest sort of intention of actually doing so, and thus should not have been taken seriously

Taking an actual list of new airports proposed as published in the July 15, 1927, issue of the old *Domestic Air News*, let us trace as far as possible whether or not the proposed projects ever were completed In this list are the names of 147 communities proposing to build airports According to our records, 46 of them now have municipal fields and 40 have commercial projects



The ideal arrangement of airports in the "blanket system." Landing fields are always within gliding distance The scheme is not as impractical as it may appear at first glance

In few places in New Jersey is an airport more than 20 mi away Any point in shaded sections is within that distance, and any point in black is within 10 mi. of an airport

Some of these cities have both kinds or more than one of the commercial types It is significant that 61 still have no landing fields that are recognized It should be borne in mind that we are excluding from consideration all military and federal airway fields

Another and shorter list issued under date of Nov. 1, 1927, includes the names of ten communities said to have proposed projects Checking these we find that five of them still are without facilities Still another list includes nineteen communities nine of which are without the facilities they supposedly sought to provide

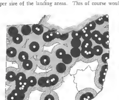
IT is interesting to note how the 1,058 municipal and commercial airports in existence compare with what might be expected as the minimum throughout the country on the basis of population According to the 1927 Census there were 746 communities having a population greater than 10,000. All of these would be potential possessors of at least one municipal or commercial field. Those above 50,000 population are potential possessors of more than one airport and those exceeding 100,000 could include anywhere from six to fifteen Los Angeles has about 20 airports within its metropolitan area New York and Chicago claim more than a dozen fields each On a basis of the 1920 Census we could expect to find a minimum of between 1,000 and 1,500 airports and landing fields under municipal and commercial auspices throughout the country This compares favorably with the actual 1,058

At first glance this would indicate that the supply has not fallen far short of the need. It must be remembered, however, that this refers only to cities and towns having a population of 10,000 or more, and it shares

the weakness of all averages in being unable to indicate distinctions Any impression that every city is adequately taken care of is false. It is well known some communities are extraordinarily well equipped and others are sadly backward Some have more than their share and others are quite off the aeronautical map. The aggressiveness of other large communities and of many having a population of less than 10,000 has produced the total which gives the favorable average

Lack of precedent was a severe handicap when the great drive on airport construction began The experience derived from the military flying fields and the average make shift commercial field then existing offered about our only guide, and a quite inadequate one

One of the earliest questions to arise was that of the proper size of the landing areas. This of course would



Ohio, at the present time, is well on the way to a complete airport coverage

naturally vary with each city, depending upon the traffic which might be expected, but there was no yardstick by which it could be determined

Controversies developed over the relative merits of various airport surfaces This was particularly acute in the matter of runway installations because here we were up against new problems Some of the usual road surfaces could be depended upon to a certain extent but the slightly different stress and load conditions imposed by airplane landings and takeoffs required special treatment Lighting was another of the new problems but there were some valuable lessons to be learned from the experiences of the air mail services

Solutions of the conundrums were sought through co-operation and co-ordination of airport people although it must be emphatically pointed out that results did not by any means bring about a situation even remotely resembling standardization. On the other hand these media served mostly to accumulate and disseminate information while individual units did what they pleased about the adoption and adaptation of this information The while airport and landing field movement is strikingly characterized by great individuality, each community preferring to work out its own pet variations

Invaluable co-operation was given by scores of business houses allied to the various aspects of airport construction That is, manufacturers of products usable at airports had an opportunity to expand their own markets, and thus brought into the laps of the airport builders the benefits of expensive research. Out of it all grew certain processes and methods which form our airport lore of today It was a bit of good business enterprise for them, of course, and a life-saver for aviation

Some of the conclusions which seem to have been evolved through all this are as follows:

(1) It is generally conceded that an airport surface should be just as large as available land and available money make possible to provide not only for present traffic and size of aircraft but also for future increases

(2) In general, all-way grass covered fields are still the best. However, this is impossible in some cases or undesirable in others. Where heavy transport operations are developing it is rather common practice to combine grass surfaces with hard-surface runways to secure the advantages of each

(3) Buildings of the permanent type are always to be erected in preference to the more temporary affairs. It is recognized that the airport is a "plant" and that therefore it should be complete, permanent and modern in every detail This has brought about lavish expenditure in certain instances, but the principle remains that airport building should be as habitable as any other sort of a business structure Within the last twelve months particular emphasis has been given to the aesthetic and comfort aspects. Comfort has been a very definite objective as airport promoters at last have recognized that club, dining and sleeping facilities of a high order have a definite place in the airport set-up This is an extremely important point.

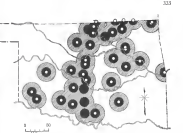
(4) The question of whether or not an airport should be operated by a municipality, private interest within the municipality for the sake of the city, or by the air companies themselves has not been settled State ownership and operation of airports has found little favor from the beginning There are a few cases of county ownership and operation but the majority are either city or commercial projects. At first it was thought that a municipal airport would be a financial as well as a community investment However, for the time being at least, following general failure to make both ends meet, they are thought of more as a public utility

Commercially owned and operated airports probably would be ideal—since they would avoid abuses of politics and graft which municipal fields often must encounter —if they could be operated without loss It is the rule, however, for the loss to occur and this throws a heavy burden upon the promoters Naturally there follows a gradual slackening of enterprise and a desire to get out from under with as small a personal sacrifice as possible, often without regard for the good of local aviation It is not fair to say that these commercially operated airports never will break even financially or return a dividend for their investors, but it is certainly a discouraging situation today

Airports developed by air transport companies and airplane manufacturing companies obviously are considered part of their equipment and losses are not serious. This type and the city type are in the best position. Few ports now are being constructed as an investment.

(5) The nearest approach to a standard has emerged in the form of airport rating regulations of the Aeronautics Branch. The individuality of airport installations is illustrated by the fact that only two airports have satisfied requirements for the first grade rating Others have applied but have not tried seriously to meet the conditions imposed. This is due largely to general indifference about the value of the ratings Some ports feel their own installations equal or excel the requirements although differing in certain respects from them

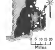
(6) Nothing revolutionary in airport design has been worked out in the last four years The fields of today are basically the same as they were ten years ago except that the refinements have been made to care for the commercial aspects A number ot airport design contests have produced some extremely interesting suggestions but they remain theories on paper at the present time



While he stays on the usual routes in Oklahoma a pilot finds himself within a 10 or 20 mi. radius of a landing place

We do not ask ourselves how this is fitting into our country-wide scheme of things To be most effective each present and proposed field should be part of some system of fields each supplementing the others and forming for the pilot a series of ground bases in whatever direction he may fly The ideal obviously would be a system of ports so spaced that at all times a plane could not be more than ten or perhaps twenty miles from one.

So far airports have sprung up singly and in groups without any of this inter-relation, except, of ocurse, along the government airways The airport map of the United States is spotted heavily in certain areas and very sparsely in others In other words, there has been no co-ordinated program we have given all our attention to local rather than the national point of view



An airplane over Rhode Island is never more than 80 mi. from an airport

At the present time there are approximately 104,000 acres of land devoted to airports in this country This figure in contrast to those previously used, includes government as well as civil ports for the obvious reason that in a blanket airport coverage scheme, the government fields would serve in emergency as well as the civil points These 104 000 acres are not much out of the 3 000 000 sq mi of territory in this country (about 2 000 000,000 acres).

How does this compare with the volume of land used by highway systems and railroad lines? Of course it is quite irrational to expect that land devoted to airports would even approximate that devoted to either highways or railroads However without overstepping aviation's legitimate dues we can expect to appropriate hundreds of thousands more acres in achieving our ideal airport set-up

Experts have estimated for me that surfaced and unsurfaced roads in this country occupy about 14 000 sq mi (9,000,000 acres). Of this about 1,819,700 acres are surfaced roadways, that is, they have some sort of treatment ranging from concrete and asphalt to oil and gravel. The value of this land has been put at $904,800,000 and its development has cost $33,780,000 000

The value of the land used for railroad transportation surfaces totals $2,699,200,702. In addition to this the value of land owned by railroads but not used for transportation purposes—that is for stations, freight sheds, storage yards, etc—totals about $500,000 000 It has been estimated that railroad rights of way using an average width of 100 ft. is in the neighborhood of 9,400 sq mi (6,000,000 acres) This again indicates that a small amount of land has been set aside for airport purposes Of course, we must admit that one of aviation's advantages is that continuous rights of way are not necessary and that therefore the comparison could be taken as indicative only

The above-mentioned airport network would call for the spacing of fields so that aircraft either on or off an airway would be within gliding distance of a field at all times The most efficient arrangement would be an airport in the center of adjustment circles with a 10-mile radius Since there are 2,973,774 sq mi of land in the whole country there would be about 8,600 of these circles. Allowing an average of about 40 acres for each one of these landing fields within each circle we would have to set aside only 344,000 acres. Such an area is minute in comparison with what we have devoted to railloads and highways without thinking anything of it Certainly aviation should be able to enjoy land grants as generous, in proportion to its needs, as other forms of transportation have secured.

This spacing has not been determined to provide a landing place always within gliding distance of any point at which trouble may be encountered It is based rather

on the premise that with modern engines there usually is advance warning. Thus, with the above system in effect a pilot would be able at all times to reach a landing place within five minutes after the trouble is first noted and before it has become so acute that a landing at once would be necessary.

The federal airway system may be advanced as providing just this coverage. It is quite true that the airways

Above: Fairfax Airport at Kansas City, Kan., one of the outstanding fields developed by private corporations as an investment. Below: The Boston Airport as it looked in the days before it became a municipal field and the subject of an improvement program costing the city more than $580,000

serve well enough for scheduled transport flying or for the incidental pleasure and commercial flying which happens to lie along the airway. The blanket system, however, would permit operating between all points and this would merely be assisting the very flexibility which aviation is able to supply. The federal airways idea under this plan would simply be multiplied and extended.

This scheme is not as far-fetched as it might appear at first glance. In the first place the existence of large areas of level, open land in certain areas precludes the necessity of deliberately preparing emergency landing points there. This would save thousands of acres from the above-mentioned total. Besides, it is a fact, that in many sections just such a layout has been approximated by the installations already made without any prearranged system in mind, bringing the number of new projects needed down still lower.

The solid black circles in the accompanying illustrations have a ten-mile radius and the cross-hatched have a twenty-mile radius. The blanket effect is quickly evident. Rhode Island happens to be almost in an ideal situation without any further emergency points. Ohio is well favored also.

In some cases the available fields together form an unofficial airway. Cities in some will be surrounded by places on which to land but once away from those areas the pilot leaving the usual route will be over terrain on which arrangements have not been made to receive him in case of difficulty. California's fields resolve themselves into such a set-up. So do Illinois and Oklahoma.

In all these examples a comparatively small amount of filling in is needed to achieve the coverage which has been described. It is true that in California and similar regions where mountain ranges enter the problem it would be most difficult if not impracticable, to produce a map showing a coverage equal to that of Rhode Island, for example.

Thus, though early promises have not been realized, airport construction has shown tremendous vitality and growth, and has been active even when other branches have slowed considerably. Expansion must by the very nature of things continue, working consciously or not toward some sort of national system. It is entirely appropriate to suggest again that in the interest of effectiveness and efficiency, a carefully engineered plan be substituted for the present hit-or-miss development.

AIRPLANES AS THE TEST PILOT SEES THEM

What are the points that a test pilot criticises in a new type? Lieut. Ofstie, veteran Navy test pilot and once a member of a Schneider Race team, observes some common short-comings on the part of manufacturers.

By Lieut. R. A. Ofstie

Flight Test Officer, U. S. Naval Air Station, Anacostia, D. C.

FROM a number of modern planes of different types recently tested at Anacostia there have been selected the following few items of criticism, showing something of the variety of what might be called unnecessary faults in the design and construction of modern aircraft. The comments in the several cases represent possible classifications of basic criticism applicable to any airplane.

(1) A tail unit was furnished with a small three-inch tail wheel and a shock absorbing device which had movement in a vertical direction only, resulting in the tail wheel being torn off repeatedly upon striking a rut deeper than the semi-diameter of the wheel. Comment: theoretical and practical operating conditions were not considered.

(2) A high performance airplane was delivered with large holes in fuselage around points of strut attachment, making cockpit very drafty and generally reducing performance. Comment: not a clean job.

(3) Rudder pedals failed in flight and continued to fail after alteration, causing considerable embarrassment in getting back to the ground. Comment: failed to follow conventional construction when the design used offered no particular advantages.

(4) Fabric on a new plane was absolutely dead, and one explanation offered was that the dope used was a new mixture which gave extra long life to the fabric but tended to make it a bit slack. Comment: page Mr Ripley.

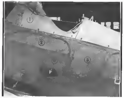
(5) Beach handling gear for large flying boat was designed extremely light, apparently without consideration for eccentric loads, resulting in failures which seriously jeopardized the plane when purely average beach conditions were encountered. Comment: error in design.

(6) To remove one particular spark plug from an air cooled engine necessitated first removing the hot spot control, attached exhaust piping, and considerable complicated cowling. Comment: maintenance had been forgotten.

(7) A rudder was so overbalanced that if feet were removed from the rudder pedals for a few seconds the rudder would take charge, causing oscillations of the plane so violent that they would probably wreck the plane in short order if permitted to continue. Comment: not properly tried out by contractor before being submitted for test.

(8) Gas tanks were provided with felt padding which pulled away from the tanks in a few days' operation. Comment: not a properly finished airplane.

(9) An air-cooled engine installation came in with individual streamlines behind each cylinder head looking very trim and neat, but the engine cylinder temperatures were high. Removal of cylinder streamlines corrected the overheating difficulty and *increased* the plane



A Few Points. A small open cockpit plane. (1) Narrow windshield and adjacent cowling—excellent visibility. (2) Cowl fasteners and lacing permitting ready removal of cowling and side fabric. (3) Fairing at lower wing root. (4) A step that never hurts the toe. (5) Baggage and tool compartment easily opened and positively secured and locked.

speed. Comment: acceptance of a general and faulty belief without actual flight trial.

THE above are typical examples of what the test pilot is continually encountering, and often tend to develop marked fluency in his use of strong language. Some of the items seem unexplainable, considering the supposedly advanced state of aircraft engineering at the peesent time. What can be the trouble with the modern aircraft manufacturer? The answer is simply that there isn't any fundamental trouble. The manufacturer makes human errors; there is no such thing as a perfect airplane.

But many seemingly unnecessary faults do crop up in new aircraft—faults, at least, from the standpoint of pilots who try out a wide variety of plane types and whose opinion is therefore largely comparative. This paper has been prepared in the hope that some general comments along this line might be of interest to people in the trade. The experience on which these comments are based has resulted largely from the acceptance testing of aircraft for military purposes. These include, however, a number of commercial types purchased "off the shelf" to be used for transport and utility purposes. The latter, though strictly non-military in their basic design, are subjected to the same acceptance procedure that is applied to planes designed to accomplish some specific military mission. And in the end it is perfectly apparent that airplanes are fundamentally all of the same breed, and that characteristics which are essentially and most of those particularly desirable, are common to all types.

IN A flight testing organization the test pilots should be men of reasonably broad experience who can safely fly all types, can observe and record data with proper accuracy, give opinions based on a fairly sound knowledge of what is wanted—and come from Missouri. If they have, or should have, one outstanding quality it is simply this: ability to accurately observe *and express in words* their opinion of the behavior and characteristics of airplanes. The job is distinctly not of the ultra hazardous type which in years gone by was always associated with such work. The pilots are merely flying observers who submit their reports to senior authority for final action.

What does a test pilot think about an airplane? His first impression, obviously, is based on a subconscious general comparison of the job in question with similar previous types. The first question asked is always the same: "What do you think of her?" and the answer, too, invariably is "It's a nice machine, a few things, maybe, to be corrected." But of course this simple statement means just exactly zero, for the ultimate valuation of any airplane is the consensus of several pilots, and is based on considerable flying, careful examination of the structure, and the study of a large amount of performance data.

In the final report the pilot must put down in black and white, over his own signature, a large number of statements and figures. These statements include not only opinions as to visibility, general performance, cleanliness of structure, stability, maneuverability, and air and ground handling qualities, but also constructive criticism in the form of definite recommendations for changes and alterations to the test model which are to be incorporated in any further production. The figures, supplemented by curves, must cover the detailed performance, which includes climb characteristics, high and low speed, propeller characteristics, etc., and must be accurate to a reasonable degree.

The pilot's reputation hinges on his ability to obtain correct data for the simple reason that every item is subsequently subjected to check by a number of persons. Likewise his value as a critic is determined by the subsequent acceptance of his recommendations for changes in plane structure, engine installation, equipment, arrangement, etc. It is obvious, therefore, that the pilot will be as careful in his observations and as sincere in his comment as is humanly possible. A mis-statement of fact or an error in reported performance is an inevitable boomerang from which the pilot has no refuge. He doesn't want to "boot the works."

The above preparatory statement is given merely that those who may be interested in what follows may have an idea of what is guiding the test pilot in his work. The airplane builder and the man who critizes the job certainly should each know something of each other's problem.

WITH but few exceptions all experimental and service types of military aircraft are built in accordance with the specifications of a contract. This contract specifies general design, dimensions, finish and equipment, and also introduces certain guarantees as to tha weight of the plane, its stability and maneuverability, and last but not least, its performance.

The commercial buyer may or may not purchase his aircraft on a contract. In any case he has definite conditions, falling in the classifications mentioned above, which must be met if the plane is to satisfy his requirements for commercial operation.

The contract or sales agreement does not define the method of obtaining the performance. The buyer of the airplane follows some one of several well known methods in reducing climb data and in determining speed performances. If the contractor is to base his guarantees on something more than a mere guess he must obviously know how the buyer determines performance. Arguments occasionally develop due to the contractor's positive assurance that his job has repeatedly exceeded the guarantees in his own flight tests. His tests are often conducted, however, with inaccurate loadings, with equipment lacking, and with little regard to the correction of observed data. If the contractor is to be in a position to discuss performance results on a sound basis he must

Speed: Boeing fighter on the Anacostia speed course

Climb: Bristol "Bulldog" ready for an altitude test

obviously conduct his trials under conditions identical with those obtaining at the buyer's test station.

It might be desirable, and this point is suggested for thought, that representatives of the various governmental agencies concerned with procurement of aircraft get together with representatives of the manufacturers and agree on standard methods of performance reduction. It would eliminate a sometime source of misunderstanding.

MOST present-day contracts for both experimental and production aircraft require that the first airplane be demonstrated by the contractor to show that it is probably capable of meeting the requirements of that particular type. For example a single seated fighting plane must be put through all variety of acrobatics, must be dived vertically for thousands of feet and must be given prolonged spins.

The demonstration is virtually the first public view of the plane in action. If it is well and thoroughly done, the first impression of the observer is highly favorable. On the other hand if the show is put on in a half-hearted manner the observer looks on it with a suspicion which is only changed by a long and successful period of operation. Some manufacturers do not seem to realize the importance of the demonstration flights and think that any pilot on short notice can take a strange plane and put it through its paces. Certainly there is no immediate financial return in a good demonstration, but the contractor who hires a good pilot, gives him reasonable time to become familiar with the plane and pays him enough to do a real show will find that his gain in prestige and in advertising far outweigh the added cost and time.

A recent demonstration before the Navy may be of interest. A contractor was required to demonstrate a high performance diving bomber, a show including long vertical dives and general air handling of a complicated nature. A number of pilots sought the job. The contractor, however, selected a man whose price was the highest, and the money was certainly well spent.

The flying was beautiful, and immediately upon completion of the various flights this pilot was able to report in detail the action of the plane throughout the dives, the engine conditions, the indicated air speeds, the accelerations, etc., and these items checked very closely with the results found later from recording instruments. The pilot did his job thoroughly, was a keen observer, and as a result of his demonstration caused a marked added interest not only in the particular type of plane being flown but also generally in the peoduct of the manufacturer employing him.

THE first impression of anything—be it an automobile, a motorboat or an airplane—is always important. That first impression may be summed up in one word—finish. If a plane is not quite done, if the parts do not quite work, if the external projections are going to be streamlined "sometime," it is not a finishad product. These items, each of which may be relatively minor and can probably ultimately be done at the testing station, do much to give a bad impression of a new plane. Unsatisfactory details must be corrected sometime and certainly it is true that work of this sort can be far more readily accomplished at the plant of the manufacturer, where every facility exists for work on that particular type of plane, than at the testing station where the work must necessarily be done without those desirable facilities.

Clean lines are naturally desired in all aircraft. Consequently, if a plane of any type is to compare favorably with other planes it must be as clean as is reasonably possible, having, of course, due regard to maintenance and installation of equipment. One of the outstanding general faults is in the matter of external wing and strut fittings, particularly where a number of fittings meet at one point. For the purpose of inspection it may be desirable that these fittings be external, in which case usually the builder can provide a cuff which will somewhat enhance the performance and greatly improve the appearance. Another ordinary criticism is that of leaving gaping holes in a fuselage cowling. For example, where landing gear struts pass through the cowling, and at points of strut attachment, small cowling plates, or sections of rubberized fabric, should correct such defects.

In most cases planes require external leads from the cockpit to wing guns, navigational lights, radio generators, etc. In a number of cases these are installed apparently as an afterthought and are stuck on struts and on the wings as though they were merely of a temporary nature. A little care in tha initial arrangement should make it possible to run these leads on tha inside of struts and wings or at least provide a fairing of streamline form.

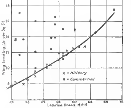
There are always a number of "gadgets" necessary for the various types. For example: steps for entry to the cockpit, leveling brackets, fittings for attachment of hoisting slings, stowage for starter crank, fuel and oil filler caps, and wind driven generator mountings. All of these may be either attached promiscuously or located with reasonable care, making all the difference between a dirty and a very trim airplane. The field for ingenuity is unlimited in the disposition and arrangement of these apparently minor details.

When the pilot first climbs into a machine he gets a distinct and lasting impression of the job in a very few minutes. The seat should permit bodily comfort and a posture allowing easy control of the plane. If he can operate rudder bars and control stick through their full range and still be comfortable, he quickly feels at home. He next puts a hand on the engine controls and ha naturally wants a position of ease. A look around the cockpit quickly tells whether it is well or badly done. A clean instrument board, with a logical arrangement of instruments, makes for confidence. On the contrary, a board with lighting switches, priming cocks and odd valves placed irregularly all over the board gives the

impression that the whole plane may be carelessly detailed

Windshields and cowling forward of the pilot deserve much serious attention All the pilot requires in an open cockpit plane is to be shielded from the wind blast, and what he particularly desires is vision forward, yet many planes appear initially with unnecessarily broad cowling and large windshields Often by the simple expedient of cutting off the corners of the cowling and narrowing down the windshield, vision forward is improved about 100 per cent

As has been proven by any number of planes it is possible for any moderate size plane (say under 5,000 lb gross weight) to have comparatively light control about all axes The usual criticism of controllability is that one control is outstandingly light or heavy as compared with the other two A reasonable control movement is normally desired, otherwise a plane is too touchy It should be the contractor's responsibility, before submitting a plane to the buyer, to have his own pilot report on controllability and try out different types



Landing Speed vs. Wing Loading

of surfaces if the first effort is not satisfactory While the effectiveness of all controls should obviously be continued as far as possible into the lower end of the speed range, it is especially desired that the elevators do not become markedly heavy at the landing speed and angle

Inspection, adjustment, lubrication, and cleaning are the elements involved in maintenance But the ease and completeness with which these may be carried out depends almost entirely on accessibility, and it is in this particular that some designers appear to overlook the importance of maintenance Parts of the control system must be capable of being actually seen either by the ready removal of inspection plates or by sighting through covered inclosures These items must also be readily adjusted and lubricated The engine is normally worked on every day and sometimes several times during the day, consequently the location and accessibility of auxiliaries largely determines the working time needed And then there are innumerable seemingly minor items which offer possibilities for saving an imposing total of maintenance time These would include such considerations as locating the fuel filler at a point clear of interference so that a standard funnel may be used, providing an oil tank measuring rod which can be secured quickly, a drain to the fuel and oil tanks which is clear of the fuselage, and fuel and oil strainers accessible to the outside

A simple matter, but one which may become a real problem after a few months of service operation, is that of fasteners for quick removable cowling Certainly everyone wants new and better fasteners which lock positively, open readily (when desired) and last indefinitely But that is a large order for a new machine just getting started in the world. It is certainly advisable to use a type of fastener which has been proven reasonably satisfactory in long service operation rather than experiment with something that is theoretically superior

One of the most underestimated items of airplane performance, especially in the commercial field, is the landing speed Undoubtedly manufacturers are honest in their statements as to what their pet products can do in this respect, but just as certainly are they frequently "off the track." It is possible that until and unless some official agency acts for all manufacturers this condition will continue

The accompanying curve, based on a random selection of twenty military airplanes of all types, suggests a rather definite relation between wing loading and landing speed The recently advertised landing speeds of twenty commercial planes representing products of about as many manufacturers, have been spotted on this chart for comparative purposes Something looks wrong If one claim is much to the left of the curve shown the chances are rather good that a mistake has been made in calculation or the individual plane is a miracle in this respect One hears a good deal about ground effect dropping planes in, and trick methods of landing There is only one way to make normal landings and that is the only fair method on which to base landing speeds, if they are to mean anything

It is surprising how easy it is to note a difference as between two planes, of perhaps 5 m p h. at normal landing speeds and 10 m p h in the 65-75 mile range. On the high side these differences may be expressed by "Fairly fast" and "Landing like a house afire." Perhaps the accompanying curve is a bit off but at the same time it covers a variety of aircraft experience which the private contractor will probably find it difficult to duplicate It is an interesting check, anyway

If the contractor has a sound organization which includes good engineers and skilled workmen, and if the following questions can be answered in the affirmative the chances are that a good airplane can be produced, possibly not the best in the world but certainly far better than if any one of these are answered with a negative

(1) Is the airplane as clean externally as it can be made with due regard to maintenance, cost and installation?

(2) Is the airplane a finished job, and have the ragged "Gimmeks" and "Gadgets" been removed?

(3) Is the visibility comparable to the best of similar types now in service?

(4) Is there in the organization a good pilot who associates regularly with operating pilots and whose advice and opinion is given serious consideration?

AVIATION
December, 1930

INSPECTION OF AIRCRAFT

By I. W. Miller

Broken strands in control cable Magnified four diameters

That careful pre-flight inspection of aircraft will disclose most of the symptoms of material failure is not an over-zealous statement has often been proven by many flying organizations under field operating conditions There is, of course, no way to determine the condition of some internal engine or plane part, and it therefore becomes necessary to place complete reliance on the manufacturer of those parts. However, with these exceptions, the inspection of an airplane will reveal its true condition One of the important determinants of aircraft inspection to date has been that most of the procedure for it is acquired only by experience It is hoped that this article may be of some practical help to those engaged in aircraft inspection It has to deal with, and exemplifies, the writer's experience in the maintenance field during many years, and should give a clearer idea of the proper routine

Control System

Safety of an aircraft in flight is so directly dependent on the correct functioning of the air controls that the most painstaking care must be taken in inspecting each element of the control system If the controls are operated by cables, it is essential that these cables be lead through fairleads wherever there is a slight change in direction The cables must be lead over pulleys wherever the change in direction is greater than 15 deg. Any possibility of the cable leaving the pulleys and binding in the sheave block is to be avoided as this is the most common cause of accidents which are classified under "jammed controls"

It is desirable that a splice be served with linen twine and there be no less than five tucks when a cable is spliced It is good practice to proof stretch every new cable up to not less than one-half of its designed strength before it is installed in a plane This not only tests the cable but takes up any stretch which may be found. Incidentally, this stretching should include all turnbuckles and shackles When installed, the threaded range of the turnbuckles must be completely screwed into the barrel and safety wire passed through and around the barrel and shanks so as to resist any loosening On a recent airplane this safety wire was soldered to the cable itself, a very excellent precaution Turnbuckles should not be subjected to any abrasive material for the purpose of polishing them, as continued polishing will wear down the barrel to such an extent that its strength is impaired. This does not mean that the turnbuckles are not to be kept free of corrosion or dirt The best protective coating is a mixture of white lead and tallow, the next best is frequent coating with grease

The use of Prussian blue, paint or lacquer, is to be avoided wherever possible, as experience shows that there is a tendency for this sort of covering to crack and allow the rust to take hold beneath the coating If an excessive amount of grease is used, there is a likelihood of dust and grease combining to form a grinding compound

A plane is no stronger than its weakest part and it is often that failure of a minor unit causes serious consequences. Inspection is therefore the most important phase of maintenance. While some of the advice in the accompanying article may seem axiomatic, its worth is proven by the unique record of the author who, as engineering officer of the Marines in Haiti, directed the servicing of a squadron of Liberty powered DH planes over the jungle with but one forced landing in more than a year of operation.

which will abrad the cable In general, the presence of excess grease and oil on any working part is to be guarded against on account of the abrasive compound which is formed where dust settles upon it

Inspection of the air controls should consist of operating them to determine whether or not the surfaces move through the required angles and in the proper direction The latter is the most important, simple as it may seem, for there are cases on record where crossed or reverse controls have been the cause of serious accidents. There should be no appreciable backlash in the controls Ordinarily, there should not be more than one-eighth of an inch free movement of the upper end of the control stick in any direction

Another essential test is that of the strength of the control system Readers of the newspapers will recall that the failure of a control stick occurred some time ago A simple test of this part can be made by having one person hold the lower part of the assembly, at some part such as the elevator torque arms, and have another exert considerable pressure on the control stick

All controls should act smoothly and easily Stiffness in handling is not to be tolerated because it indicates binding at some point and also because it destroys the delicate reaction, particularly the lateral controls

It is good practice to make examination for wear and for smooth and easy functioning upon the stabilizer adjusting mechanism Adjusting screws and blocks are the points where the most wear occurs and it is there that the inspection should be centered The writer suggests testing of cables and chains in a similar manner to that used on the control cables.

Engine controls should not be forgotten Not only should they move in the proper direction but they should move the proper amount It is best to see that there is no backlash or lost motion, and that all parts are in alignment Naturally, it is not permissible to have any part of the engine controls foul the structure at any point, and there must be no binding It is also good practice to inspect the wiring and ignition system, both for possible short circuits and for loose contacts In the event that sufficient time does not permit a thorough inspection of all parts of the plane, it is best that the inspection of controls have precedence

Fuel and Oil Systems

CAREFUL and routine inspections are necessary for the fuel and oil systems It is imperative that there be no chafing between the tank and any other component part of the aircraft Felt pads should be used as insulating material for the tanks in preference to raw hide which is likely to hasten corrosion

Fuel lines are usually of seamless annealed copper tubing and care must be exercised to make certain that the piping be annealed after all forming and bending is done. It is well to remember that working of copper hardens it Bends should be gradual and not abrupt Gasoline and oil hose are rubber-lined, and a metallic liner is always used to join the ends of the fuel line and to prevent particles of rubber from entering the line. It is suggested that hose clips should not be taken up too tightly for in that case, they cut through the rubber hose. A copper bonding strip is used to join the two sections of tubing around the hose coupling The solid connections are to be carefully assembled to guard against damaging either the lines or fittings All fuel and oil lines must be prevented from vibrating and chafing. It is well to remember that excessive vibration is the cause of the majority of fuel line failures

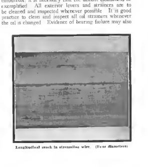
The use of stainers is necessary and their inspections must be frequent. They should be readily accessible. A water trap or drain should be provided so that the lowest portion of the tank can be drained when the airplane is at its usual position on the ground Good practice dictates that fuel systems be removed and annealed periodically. A good rule is to anneal the lines when an engine is replaced and to renew the lines when the aircraft is overhauled The deteriorating effect of oil upon rubber frequently is not realized, all rubber connections must be kept clean and uncovered

If pumps are used in the fuel system, the relief valves will bear inspection approximately every 50 hr Such valves are usually spring loaded and these springs may show side wear on the valve chamber or may lack strength in compression A long, lightly loaded spring makes for a very sensitive action In many cases this causes an abnormally rapid fluctuation of the fuel gauge indicator

Power Plant

IT is highly important that a daily inspection be made of the engine Beginning with the engine mount itself, the bolts should be solid in their holes and nuts cotter-keyed It is imperative that air-cooled cylinders be kept clean for two reasons: first to insure proper radiation, and second to facilitate proper inspection Burned or blistered enamel shows evidence of improper lubrication or overheating If there is any evidence of oil leaks between the alloy cylinder heads and barrels the cylinders showing such leaks are in need of replacement There have been occasions when the entire cylinder head has failed at this point, the writer witnessing one such failure when the cylinder head blew off just as an engine was being cooled following a flight.

Spark plugs and bosses should be tight and spark plug leads must be locked to the plugs by safety wire. It is necessary that all ignition wire insulation be unbroken and free from moisture or oil Protection is to be provided from chafing at all points As to the carburetor, it is necessary that the utmost cleanliness be exemplified All exterior levers and strainers are to be cleaned and inspected whenever possible It is good practice to clean and inspect all oil strainers whenever the oil is changed Evidence of bearing failure may also



Longitudinal crack in streamline wire. (Four diameters)

Corrosion of aluminum alloy in its early stages

be checked at this time by examining the oil strainers for small particles of bearing metal on the screens.

A check of valve clearances approximately every ten hours is considered good practice. If a carburetor is equipped with an exhaust heater it is well to have it practically cut off during hot weather although sufficient exhaust gas must be introduced into the heaters to prevent frost forming in the intake, which has the effect of reducing the outlet temperature of the lubricating oil. This is an especially wise precaution in hot climates and when the engine is being operated at or near its peak performance The foregoing is particularly applicable to air-cooled engines Leaks in the heaters which allow the exhaust gas to escape into the rear of the engine compartment may be discerned by soot around the holes

In aircraft equipped with batteries, the battery must be well anchored and the leads secured It must be remembered that the battery acid causes corrosion of every common material except rubber For this reason, it is well to remove immediately any acid which has splashed out and to stop any corrosion by some alkali wash followed by thorough cleaning

The magneto points must necessarily be inspected periodically The points must have the proper clearance and the magneto be in proper time The most common causes of excessive vibration in a properly assembled engine comes from the improper magneto timing, unbalanced propeller or improperly adjusted valve clearances Improper magneto timing often causes high operating temperatures and also prevents the engine from turning up its rated speed

In connection with the engine inespection, an examination should be made of the fire wall It should be intact and well secured Practically all aircraft are fitted with pressure fire extinguishers This type of extinguisher demands inspection to make sure that sufficient liquid is in the container and that the proper pressure, usually 100 lb per sq in, is pumped up in the system

Once the engine inspection is finished, the next item is the propeller In the case of propeller with detachable blades, the pitch of the blade is usually adjusted with a protractor and the base plates when in the shop A protractor is now available which can be used while the propeller is still on the engine

It is necessary that the blades be examined for dents and cracks Cracks will usually begin at a scratch on the surface of the metal When one of the first type metal propellers had been adopted for use, there were several failures It was found that the failure had begun at a point where a metal lettering stamp had imprinted a hyphen on the blade surface

The propeller lock nut should be properly locked and safetied and the blade locking clamp inspected for cracks It is good practice to insert the hinge pin joining the two halves of the clamp in such a manner that the head of the pin is on the side next to the crank shaft This is to prevent centrifugal force throwing it out in case the cotter pin is loose or broken The nut which tightens the locking clamp must be safetied with a cotter pin The propelled should be checked for track, the maximum tolerance being one-eighth of an inch This should be done with the plane blocked up, off its tires and skids

In general wood and Micarta propellers require similar inspection These types are usually tipped with metal and this sheathing sometimes has a tendency to loosen or buckle.

Fuselage Examination

PRACTICALLY all types of fuselages, as found today, whether they be of metal or of plywood construction, can be given a visual outside inspection for failure of fuselage members In the case of fabric or metal covering, the misalignment will be apparent on account of wrinkles in the fabric and metal or from torn rivets in the metal covering The wooden covering will show cracks or bulges in such cases Such a discovery calls for internal inspection, and in most cases calls for a major repair All accessible internal brace wires should be tested for tautness If the condition is found to exist in all the wires it proves that the various compression members have not changed in their relative positions Any slack wire, however, must be subjected to careful examination to determine the cause of its condition

The points of attachment of the landing gears are perhaps the most highly stressed parts of the fuselage These deserve careful examination to make certain that signs of failure have not developed Such signs of failure are shown by loose bolts, elongated bolt holes or incipient fractures The attachment points of wings or cabin structures should be examined for the same faults

Metal members are always to be watched for evidences of corrosion In metal fuselages the lower longrons will show corrosion first, as a rule. Ten per cent of the metal thickness usually is the accepted maximum of corrosion that is allowable before a part should be replaced Duralumin fuselages are to be considered as more susceptible to cracks and fatigue failure than the steel types

Landing Gear

THE landing gear is perhaps subjected to as great a stress as any other assembly, and unceasing care must be taken to assure its proper functioning The

shock absorbing medium, whether rubber or oleo, must be kept at its maximum efficiency. In oleo gears, leaks must not be allowed. The wheels should be sound and the wheel retaining collars properly secured. There is no valid excuse for the loss of a wheel. It is good practice to keep tires in good condition and properly inflated. Leaky inner tubes cannot be tolerated. It is well to examine the axles and struts for rigidity and to see that they are not bent.

The tail skid or wheel assembly requires careful attention in order to guard against excessive wear or breakage. The shock absorbing medium should be maintained at its maximum efficiency to prevent transmission of dangerously severe stresses to the fuselage. Recently, an airplane, developed by one of the largest manufacturers, developed trouble for this reason. The shock absorbing medium used was rubber and after continued use it was necessary to strengthen the fuselage member to which the absorber was attached. There should be evidence of lubrication at all of the bearing points in the tail skid assembly.

Wing Cellule

THE inspection of most wings can be made only by examination of the outside, except at those points where inspection plates are provided. The fabric, if the wings are fabric covered, can be tested for tautness by thumping it with the fingers. The condition of the fabric can be told very accurately by this method, after a little experience. A dead condition lowers the efficiency of the airfoil and indicates that new fabric is needed. Due consideration must be given to the atmospheric conditions during this test, as on a damp day the fabric always appears looser than on a day of low humidity. Sometimes a wing covering which has lost its tautness can be restored by another coat of pigmented dope.

The ribs can be tested for broken places by pressing along the cap strip and loose internal brace wires can be found by striking the wings and listening for their rattle. Metal-covered wings should be inspected for cracks in the covering and for loose rivets. Cracks usually originate at the rivet holes. Plywood-covered wings are liable to deteriorate at the glued joints, which leads to bulging of the plywood and to rotting. The leading and trailing edges of all wings are most liable to deterioration. It is well to examine the lower surfaces of panels for holes and rips, while the top of the upper wing can be examined for deterioration due to the action of the sun's rays. As in the fuselage, a wrinkle in the fabric usually indicates that all is not well with the structure. Tears or holes in the fabric must be repaired immediately, and the protective covering of paint or lacquer must always be intact. It is essential that the aileron controls within the wing panels be examined for looseness and a check-up made to see that the nuts are safetied. All fittings should be examined for cracks or bending and where metal fittings are fastened to the wood members of the wings, there should be no evidence of crushing of the timber. It is important that the fabric be properly attached to the ribs by stitching, and this rib stitching should be spaced at closer intervals within the propeller slipstream. Wing struts must be examined carefully for breaks or bowing and for evidence of corrosion. It is well to replace any strut which has become bowed or which vibrates excessively.

It is well to inspect all interplane and streamlined wires for corrosion, wear, and small cracks which are the result of vibration. Any injury to the wire during adjustment may be avoided by using carefully and properly fitted wrenches. Another often forgotten axiom is not to screw lock nuts too tight and in doing so to strip the threads. Strut and wire ends should have a sufficient number of engaged threads and this can be inspected by trying to pass a wire through the small holes in these parts. If the wire does not pass through the holes, there are enough threads engaged. Examination of the cowling is imperative in order that it may not come loose in flight and cause serious damage.

Abnormally severe landings impose unusual stresses upon the whole aircraft and, after such landings, careful examination of the entire structure is necessary. If a wing tip touches the ground, inspect the path which the stress would follow. This begins with the wing and includes struts and wires and goes up to the attachment fittings on the fuselage. Landings on one wheel sometimes cause buckling or breaking of fuselage members adjacent to the landing gear fittings.

Control Surfaces

CONTROL surfaces are liable to the same defects as wings. The fabric should be taut and whole, and the struts and wires must be inspected regularly. The hinges require examination for wear, and excessive looseness, which might cause the surfaces to become loose in flight, should be immediately rectified. It is a good policy to test the control horns for strength and rigidity, and to be sure that the bolt holes are not worn.

Aircraft in use will gradually get into poor condition due to wear and tear incidental to flying and landing, and also due to the deterioration of the material used in the manufacture of the aircraft. The wear and tear can be readily found by inspection and when it has reached the limit from the standpoint of danger, the aircraft should be repaired or discarded. The material deterioration progresses at a slow rate however. Wood parts deteriorate more rapidly under extremes of climatic conditions. In dry and hot climates, the wood will tend to become brittle, in damp climates the wood develops fungus growth. Glue and plywood are affected by moisture to a dangerous degree. The protective coating of all parts must be maintained in the best possible condition.

After corrosion has once begun, it is extremely difficult to remove. Corrosion on steel members can be detected readily as it appears as ordinary rust. Aluminum or any of its alloys shows the corrosion as a light colored powder. Corrosion, under enamel or paint, causes the protective coating to blister and rise.

It is always well to insert clevis pins, cable and strut terminals, and bolts in their fittings with the head uppermost, if possible. This reduces the possibility of them falling out in the event of failure to safety them properly. A good rule is that nuts should be inboard to the rear and downward, except on the tail surfaces where they should be outboard to facilitate inspection.

The most thorough inspection is one which proceeds in a regular and routine manner. Experience has shown that a check list is the best way to assure this and to provide a record of the inspection. No human memory is infallible and for this reason, important parts might be overlooked very easily. The intervals between inspections are governed by the type of aircraft, amount of use, and the nature of its use. The continued perfect performance of an aircraft and engine is directly attributable to the efficiency and good workmanship of its overhaul and maintenance crews.

PREPARING FOR THE PRIVATE MARKET

By Robert M. Burtt

Now is the time for airplane manufacturers catering to the private plane market, to lay out a definite plan of attack for 1931. In this article Mr. Burtt, who needs no introduction to the readers of AVIATION, presents his views regarding the private plane market problem. Among other things, it is his contention that the private market is really two distinctly separate airplane markets and should be developed as such.

IT was confidently believed a year and a half ago that large numbers of airplanes would be sold to private owners. Everybody would be flying. The past year has shown such a belief to be a mistaken one. Large numbers of airplanes have not been sold either to private owners or to commercial aviation operators. As a matter of fact, in the belief that a considerable volume of sales would materialize, more planes were manufactured in the year 1929 than the market could absorb. The industry temporarily is suffering the logical after-effects of such unwarranted optimism. The aircraft business has found a few buyers for its product but not in numbers sufficiently large enough to allow the industry to inaugurate production methods that could result in legitimate profit-taking. This especially in view of the fact that at the present time airplane sales are divided between 70 companies manufacturing approximately 300 models of airplanes which boast approved type certificates. On Jan. 1, 1930, there were a total in the United States of 9,840 licensed and identified planes. Approximately 5,300 new commercial machines were built in 1929. Divided among 70 manufacturers each factory made an average of 75 planes during that year that were sold. Hardly enough to warrant production methods of any kind. As a matter of fact had that amount of business been divided among two or three manufacturers better airplanes at more reasonable prices would have been produced. Imagine an average automobile factory only producing 75 cars a year. Under such circumstances the product naturally has to be one practically hand-made at high expense.

There are in the United States about 120 million people. There are approximately 26 million automobiles. Less than five people to a car. With nearly 10,000 licensed and identified planes there are about 12,000 people to one plane. Or 2,400 cars to one plane. But it must be remembered that most of the airplanes are for commercial use. At least 80 per cent. These ships are used in passenger and mail transportation service, flying schools, by aviation accessory firms, by companies who are using them for some direct aviation business use. In a certain mid-western city with a gross population of one half million there are only ten privately owned planes. And that means privately owned in the strict sense of the word. For sport, pleasure or some business which has no direct relation to aviation. This is private plane ownership at the rate of one plane to 50,000 people and in the category above defined it is doubted whether a close country wide survey would increase it. At that rate there would be 2,400 planes for 120 million people in the United States in this particular class. It was previously stated that of 10,000 licensed and identified planes about 80 per cent were for some direct com-

mercial aviation use and on that basis there would only be 2,000 planes in the privately owned class, which checks fairly well. In a recent survey of pilot licenses by R. Sidney Bowen, Jr., Managing Editor of AVIATION, the fact was brougt out that only 36 per cent of those holding private licenses own their own plane. Inasmuch as there were only 4,162 private licenses extant on Jan. 1, 1930, there were only 1,510 private owners at that time who flew their own ships. There are certainly not more than an equal number of privately owned ships where a pilot is hired to do the flying.

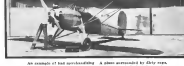
ONE of the big problems facing the aviation industry at the present is the development of a large private market. Such a market is divided into two sections. Those who will buy planes and hire pilots to fly them, and those who will buy planes and fly them personally. Of the two the latter is potentially far the greater. There are only two general markets for aircraft. First, the commercial aviation operators. This includes passenger and mail transport lines, schools, taxi lines, accessory firms, any operator who is using the plane for a strictly aviation use. Second, the private market. This means every plane that is sold for some purpose other than that defined in the first class. They may be used for sport or pleasure, for business, or for a combination of those two uses. If for a purely business use the plane must prove itself to be of economic value. If it does not prove itself to be such the business should not own a plane and the salesman who sold it made a grave mistake.

The first class, the commercial operators' market, will take care of itself. It does not have to be sold the idea of aviation and it knows what it wants. Air transportation of mail and passengers is a specialized business of its own and is rapidly forging ahead to a well-merited success. This class forms a rapidly expanding market for aircraft. But—and this point should be made very clear. The planes that are manufactured for this market are going to be flown by professional pilots. As a matter of fact all of the planes sold to commercial operators are to be so flown. It is true that the two markets overlap in one particular. There are many firms which would be classed as being in the private market that do buy, and will buy, planes designed for rapid transportation. It is only logical that they should, for that is the purpose for which they are to be used. But—they hire professional pilots to fly them. Therefore it might be well to make a further division of all airplanes into two general classes under a different definition—as to who is to fly them. Under this heading there are two kinds of airplanes—those designed to be flown by professional pilots and—those designed to be flown by private pilots.

Those in the industry are fully aware of the demands of rapid air transport. In this field performance is master and speed reigns supreme. And this in only right, for speed is the commodity for sale. Of course comfort, convenience, and safety are factors which have to be considered in the degree which they are important. Of these safety comes first. Those having a general acquaintance with aircraft without any special engineering training also know that when the high speed of an airplane is increased the landing speed has to be increased also. That is all right as long as it is kept within reasonable bounds. Professional pilot personnel is being constantly trained to cope with this situation and to fly such aircraft with a reasonable degree of safety. The average well-trained professional transport pilot is far more capable of handling airplanes that land at 75 m.p.h. than is the average private pilot of handling one with a 35 m.p.h. landing speed. Moreover engineering skill is constantly increasing the variance between landing speed and high speed. Whereas with present type transport ships the high speed is about double the landing speed it is not improbable that this will soon be stretched to triple the landing speed.

There have been various reasons advanced for the failure of the industry to open up profitable volume of aircraft sales in the private market. Lack of airports, of adequate service facilities, of comfort and convenience both on the ground and in the air, high prices of planes and flying courses, bad merchandising methods and poor salesmanship, all these have had their proponents. Many have claimed that all the industry has needed is a meagre sprinkling of business brains to successfully solve the problem.

The engineering and production departments have said to their brothers of the sales: "We have done our jobs. We have produced good planes. Here they are. Why in the world are you falling down on your job by not selling them?" As a consequence desperate measures have been taken to bolster up sales departments. At first pilots were given a chance. They knew the planes and could demonstrate them. They failed. It was then agreed that pilots were not salesmen so the proper procedure was to get high-powered salesmen from other lines of merchandising and have them go out and do the selling. Teach the salesman to fly! That was the cry on the theory that it is easier to teach a salesman to fly than it is to make a salesman out of a flyer. At last the panacea for the merchandising ills of aviation had been found. But by all means whether the salesman learned to fly or not, let him do the selling. This scheme was not much more successful than the first. And then dawned the era of the pilot-salesman. And here was the best bet. There are some men out representing aircraft companies whose combination of flying skill and salesmanship



An example of bad merchandising. A plane surrounded by dirty rags, tools and other repair implements makes a bad first impression

are a real credit to themselves and augment the prestige of the companies they represent. Unfortunately most of these men are confronted by a situation which is utterly beyond their control.

There is unquestionably a limited private market for present type high performance airplanes. It has hardly been scratched. But whether or not the plane has been bought for business or pleasure a professional pilot is hired to fly it. There are a number of wealthy sportsmen in the United States who will buy such planes and operate them for pleasure alone or for a combination of pleasure and business if intelligent selling methods are used in soliciting their business. There are also a large number of industrial and commercial firms that can profitably use an airplane in their business. However, in order to sell such companies real salesmanship is essential. The aircraft salesman who haphazardly goes into every business office and says to the proper official: "You need an airplane in your business. You must be up-to-date, keep abreast of the times. If you don't your competitors will get your business," is very foolish and is doing more harm for aviation and himself than he is good. Such a proceedure subjects him to ridicule. He must analyze thoroughly the particular needs of that business and then, armed with the proper sales material, of which honest operation costs will plan no mean part, he will show the official that an airplane or fleet of them in his business will be an economic asset.

WELL, what about the great private market—the large volume sales outlet of privately owned and privately flown planes? Of all the departments of commercial aviation that have been most roundly abused in the past year sales it has been the private plane department. It probably would not be an exaggeration to say that in most companies the personnel of this department has suffered a 200 to 300 per cent turn-over. Outside of those in the engineering and production departments who are out of work temporarily, due to a surplus of stock on hand, these organizations are practically the same. It seems highly probable that in the next year there will be a considerable turn-over of aeronautical engineers and designers. Why? Not so much because they have produced something the public didn't want. Whether the public wanted present-type planes or not they couldn't handle them. At least private pilots couldn't and in that class are the greatest possibilities.

In order to make any appreciable inroads into the vast private market the aviation industry has got to do a quick about-face. And it is beginning to do that today. It has taken a lot of time to learn the lesson, and has cost millions of dollars but the time has come at last. A new crop of engineers is coming into being who sense the need and opportunity of the private market. We refer to the present excitement over power gliders. The industry is going back 25 years to fundamentals, at least in respect to catering to the private market. To hear some of the talk going around the impression is gained that something new has been invented. The truth of the matter is that it's so old that it's new. A power glider (a misnomer if there ever was one) is nothing more than a real old fashioned airplane with improved stability and a better power plant. The author has carefully noted the keen interest shown by the public in gliders and power gliders, especially the latter. On every hand the expression is heard: "Now there's something I believe I can fly. Lands real slow." The public for its own personal flying doesn't want performance, at least not until it is used to it—the public wants to get into the air, to learn to fly. It wants something to sport about in like an outboard motor boat, something reasonable in price and upkeep, and above everything else easy and safe to fly. If the ship cracks up there won't be so much chance of getting hurt due to its low landing speed and no fortune will have been lost. It should have a landing speed of not more than 20 m.p.h. and need not have a top speed of more than 40 or 45 m.p.h. There is only one factor holding back progress in this field and that is the development of a dependable power plant of low horse power. However, that is a mere mechanical problem easy of solution and will certainly be solved within the next few months or year. When that time comes and it is coming rapidly, it is the writer's belief that there will be one privately owned and flown airplane to every 1000 population instead of to every 50,000.

THE claim has been made that private owner-pilots will not buy airplanes that do not have a reasonably high speed. If they don't have such a performance the owner won't be able to fly anywhere faster than he can drive a car. That is all wrong. The average owner-pilot doesn't want to go anywhere! The author made a survey of a number of private owner-pilots and found that less than 10 per cent of the total flying time for a year had been on cross country flights away from the home airport. And that was with high performance types that could get up and go places right now. The average owner-pilot is afraid to get very far from his home airport in a high performance plane because he knows he's not competent to handle the ship in case the engine quits or he gets into bad weather. Once in awhile they do go on such flights but only over good country and when the weather is just right. The private pilot wants to learn to fly first, to get accustomed to the air. He wants to develop confidence in this new element. After he achieves that his desire, in many cases, will be aroused for a plane of higher performance, one that he can go somewhere in. Getting a larger number of people into the air flying their little put-put low performance planes is going to do more for the sale of high performance commercial ships than any one other factor. However, for the vast majority of owner-pilots for many years to come the low performance planes, call them power-gliders or any other term that seems to fit best, are going to please and satisfy. Get this generation into the air and accustomed to a safe landing speed of 20 m.p.h. and as the years roll by, as the present generation and its children get used to flying, as the new generations come into being, the landing speed of airplanes, which the average individual can safely handle, will be gradually pushed back up to where it is a present. This may take a long time in point of years but there is always the possibility that inventive genius will give birth to a plane that will have a top speed of many times its landing and take-off speed.

As soon as the engineers learn that they must build for two classes of pilots, which roughly represent two distinct separate markets, and actually turn out something to fit the private owner-flyer, some real money is going to be made by aircraft dealers who will specialize in merchandising to the private market. And, incidentally, by the manufacture of these planes. The dealers will sell, teach to fly, store and service airplanes profitably in such quantities that they will be so pleased that they will hardly believe they're in the aviation business!

THE PURCHASING DEPARTMENT'S RELATION TO AIRLINE OPERATION

By Daniel Sayre

Assistant Editor of AVIATION

THE purchasing department of any large industry has a thousand complex duties Even if the industry is an old established one and its activities are quite standardized, any purchasing department must know the wants, history, plans, and functionings of all the branches of the particular company it serves and must continually study the markets of hundreds of commodities as to price, quality, trade discount, and reliability of source.

Extending the functions of such a department to serve its twenty thousand miles of airlines and scores of airports in 29 countries which among other things use four different languages is not the least of the remarkable feats of Pan American Airways.

The entire personnel of the purchasing department of Pan American is not very large Probably not over thirty of its thousand employees are directly concerned in this work The purchasing agent, a few assistants, a clerical force in New York City, and a divisional purchasing agent and a clerk in each of Pan American's six divisions complete the roster And yet the expenditure of $4,000,000 annually for operating supplies and materials must be intelligently and accurately carried out, and countless thousands more invested in permanent flying and airport equipment

From the time the need for a thing is felt to the time it is permanently discarded or consumed, the purchasing department must be in continual touch with it

As a sample let us take a sheaf of purchase orders which have originated on the Central American division One calls for 40 drums of gasoline, another for certain food supplies, another for some airplane parts, rivets, grommets and the like.

The orders are first countersigned by the division engineer or operations manager and are delivered to the divisional purchasing agent He studies them carefully Some of them can be filled locally but the gasoline and mechanical parts are in general beyond his powers Almost all technical and manufactured stores must come from the United States though sometimes small quantities of wire, tools, and small general hardware can be purchased locally The food order he carries out in large part but even here many items of diet for the American

Pan American Ford plane at France Field, Canal Zone about to start on inaugural flight over recently established mail line

To those not directly connected with the purchasing department of a well organized airline the functions and duties of that department are little known and less understood. As a matter of fact the purchasing department might be considered as the keystone of operations. Its various tasks keep it in constant touch with the problems of every other department of the company. And, as brought out in the accompanying article, which deals with the purchasing department of Pan American Airways System, each new day brings up additional problems to be solved.

Franklin W Glendhill, purchasing agent of Pan American Airways

Divisional map showing various lines of the Pan American System

personnel must be imported from the States. Meals for passengers are generally contracted for from local caterers

The order forms he cannot fill he examines for accuracy and forwards to New York They are not complicated but sometimes the article desired challenges description, certain fittings, certain items of small hardware, complicated specialized equipment parts are as difficult to describe verbally as a sunset, terms like gadget and dingus are not allowed A common expedient is to enclose the offending part with the order A small mistake of thread direction or material specification might cause serious delay

The orders are received in the New York office The order for gasoline is filled immediately There is a technically trained member of the purchasing agents staff whose sole duty is gasoline Purchasing a million and a half dollars worth of fuel a year is not a part time job for any one. It is his duty to carefully study the requirements of the various engines in the companies ships, prepare specifications, study the fuels offered by the various oil companies and establish contacts and contracts with them He must have knowledge of the company's stores of fuel and be able to expedite shipments After the fuel is delivered he must follow up reports as to its performance. The particular order in hand for 40 drums will probably result in a shipment of 60 for the freight charges are the same for the latter as for the former being a full carload And such savings are for the purchasing department to carry out

The remainder of the food order will be turned over to a food supply house with which the company has had previous satisfactory dealings, probably it will be located in Miami or Brownsville, the two American bases of the System.

The order for mechanical supplies requires rather detailed treatment If they are airplane parts they will probably be secured from the manufacturer. Though if they are in large quantities and such standard items as bolts, grommets, rivets, etc, they may be purchased in the open market

In any case the company's purchasing index is consulted Every purchase that has ever been made is carefully recorded and filed, with a description of the article purchased, any specification used the index number that has been assigned the vendor, the unit price, and the trade discount allowed If the article on our order is found in the file and all the above items are found satisfactory the result is a repeat order to the former vendor, though often specifications are changed, new discounts arranged or new sources of supply investigated

If the article is a new one in the company's experience, and this is constantly occurring although there are already thousands of items listed in its file, a very com-

plete collection of catalogues and trade directories is consulted. If the time is important the engineering department is asked for any technical specification necessary and the available sources of supply are approached for bids

A recent order which is typical asked for a number of quick-inflatable life preservers. This was turned over to the engineering department which studied existing types suggested improvements and wrote specifications as to materials, strengths, and buoyancy. Some ten firms were approached, four replied, one offered a satisfactory product at a lower price than the others and the contract was let

Some times the orders are filled from the company's supply bases. Very often one division may have a surplus of an article desired by another. Divisional inventories are continually studied so that transfer of supplies can be made without undue loss of time

The mere placing of the order is not the end of the purchasing department's task by any means. For one thing there is still the important task of expediting shipments. Many small parts and orders are forwarded directly in the company's planes but the bulk of the shipments must travel by train and boat. Since the great majority of shipments are exportations forwarding agents are employed in New York, Miami, and Brownsville who take care of packing, customs, and manifests.

The behavior of the purchase must be proven satisfactory. Pan American might be called the greatest civilian testing laboratory of aeronautical equipment in the World. Raw materials are actually given a physical acceptance test. Once a shipment marked duralumin turned out to be ordinary aluminum and the possible consequences were so alarming that equipment was installed and actual strength tests are given materials of


Purchase Order No. N 114
PAN AMERICAN AIRWAYS, INC.
New York
PAN AMERICAN AIRWAYS SYSTEM

A typical purchase order as employed by Pan American

this type. Often a new piece of equipment is experimentally tried out in service before an order is placed. A recent example of the Sperry Artificial Horizon Indicator which was tried on one of the company's planes for several months and incidentally proved quite satisfactory.

Since its inception the Pan American System has been organized in divisions much like any railroad of considerable length. Each division is quite autonomous as to operations, personnel, flying equipment and administration. Eventually it is planned to have them also mutually independent as to stores and equipment overhaul. The divisions of the Systems are shown in the accompanying map, each one has a main base, at which the bulk of its stores is kept and important repair work is done, and one or two lesser bases where some supplies and shop facilities are located. Superimposed upon and extending down through these divisions are the customary functional departments of the organization. Engineering, airports, traffic, communications, Executive, and Operations. For each of these the Purchasing department must furnish a varied and detailed list of materials, equipment and supplies

Under the engineering department is grouped research and specifications work and the maintenance for the entire system. Much of the maintenance is done in the divisional shops but complete overhaul of planes and engines has been to date entirely localized at the Miami and Brownsville bases which are in this respect interdivisional and where major stores are kept. Machine parts, raw materials, technical supplies, shop equipment in infinite detail are required by this department

The airports department has complete charge of the upkeep and improvement of fields and terminals and requires such equipment as rollers, drainage tile and building materials. The traffic department absorbs waiting room furniture, uniforms, food and office supplies

Communications controls of course the radio system. Each airport and plane is now equipped with two way radio. The sets are manufactured by the Company itself and the purchasing agent must furnish everything from tower masts to grid leaks

The Executive department comprising the Accounting, Publicity, Foreign Relations and Purchasing departments are fairly consistently limited to office supplies and furniture

The operations department, last but not least, absorbs the large item of fuel and the bulk of the capital expenditures. All vehicles are under its control. Busses, trucks, motor launches, tractors and of course, the aircraft themselves.

Possibly the most interesting development that has been carried out through the department has been the perfection of the flying equipment used by the Company. Orders for flying equipment and other important capital expenditures must originate in the executive committee of the company, but the functions of the purchasing department are none the less important. The contracts must be supervised, special modifications must be incorporated in the original orders if possible and once the planes are in service the purchasing agent must unify, consider, discard, or put through all the suggestions for modifications which must be added to any newly produced airplane to increase the reliability, comfort, and performance which result from day in and day out flying. Some changes are covered by the manufacturers warrant and are made at his expense, others must be made at the company's.

FLIGHT INSTRUCTION AND FLIGHT THEORY

By W. F. Gerhardt

The last of two articles embodying some interesting comments regarding the advisability of giving the student ground instruction as well as actual flight training

THE theorems discussed in Article One concerned the operation of the airplane at full throttle. The student should be instructed in another interesting and important peculiarity of the airplane,—the effect of throttling the airplane engine. Many students share the popular belief that to increase the speed of the airplane the pilot has only to open the throttle, as he would do in an automobile. This will increase the climbing rate only and leave the speed unchanged, unless the pilot at the same time reduces the angle of attack by pushing forward on the stick. To increase the speed without change of altitude requires a close adjustment of the stick and throttle. Skill in co-ordinating these controls is especially essential in formation flying. The writer is reminded of an incident which occurred at a training camp in 1918

A squadron of seven cadets were flying formation at dusk. Number Five cadet, the motor of whose airplane was not functioning properly, watched his tachometer too intently, when he glanced around to check on Number Three, the man ahead, to his left and below, he found the other airplane about five feet directly below him. As he was about to open the throttle and pull up and away, before a slight gust should cause the airplanes to collide, he glanced above him and saw that Number Seven, who should have been well behind and to the right, was approximately five feet directly above him. His first thought was to open the throttle quickly and pull ahead of both of them, since he was already throttled down to the lowest notch, but he recalled a statement in a textbook about the delicacy of this maneuver and became so frightened that he did exactly the right thing

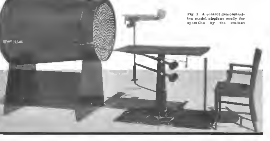


Fig 3 A control demonstrating model airplane ready for operation by the student

—' froze" to the controls Fortunately Number Three observed the situation a few seconds later and dove away

There are other examples of the effect of theoretical knowledge on flying technique Incorrect knowledge will affect flying adversely. For many years a rather strange explanation of lateral stability has been presented in some text books It is known as the "horizontal equivalent " According to this theory, as soon as an airplane having dihedral is turned on its side by a gust or other disturbance, the projected area and hence the lift is greater on the lower wing than on the higher, and a moment is produced which rights the airplane This is obviously fallacious No restoring moments are created until the airplane commences to sideslip, so that the angle of attack becomes greater on the lower than on the upper wing If this explanation had no bearing on the method of flying, its presence in laterature might be harmless But the student flyer may be justified in assuming that the airplane is unstable if it does not immediately return to normal when rotated laterally, and that the side slipping is a further evidence of instability He will probably use the aileron before it is necessary, thus overcontrolling, instead of allowing the airplane to "wallow" a little, which is the characteristic oscillation of a stable airplane If this oscillation is too violent the airplane is improperly designed, and in this case the controls must be used continuously

Fig 4 The special airfoil balance developed to show student the difference between stable and unstable airfoils

LANDING is the most difficult maneuver to learn It must be practiced more than any other maneuver and the student can learn very little about it on the ground Flying instructors usually distinguish four stages (1) the selection of the proper altitude at which to cut the motor and glide in, (2) the control of the airplane in the glide, whether straight or circling, (3) the determination of the proper distance above the ground at which to level out, and (4) the actual three-point landing The execution of all these maneuvers is mainly a matter of judgment of distance, which can be acquired only by air practice. The fourth stage is usually much better executed, however, if the student bears in mind the following rule, which is one of the paradoxes of flying "To land an airplane on three points attempt to prevent it from landing" In other words after leveling out at the proper altitude, the pilot holds the airplane at constant altitude until it stalls

There are several methods by which the student can develop judgment of distance during landing with little risk to himself or equipment Some instructors have their pupils fly over the ground at four or five feet altitude, throttled fairly low, so that he becomes accustomed to the appearance of the ground from the altitude of leveling out There are also certain cloud formations which are so nearly level on the top that they may be used to simulate the ground and both leveling out and three-point landings may be practiced without danger

It would be possible to cite numerous other instances of the value of prefacing flying instruction by adequate theory but the foregoing are perhaps the most important

The question naturally arises "What method of instructing the student pilot in these theorems of flight will produce the desired results in the minimum of time?" He must not only grasp these ideas correctly, but must do so in the comparatively short interval between the time he decides to take up flying and the time his air work begins The answer seems clear if one is guided by the educational theory already mentioned According to the third and fourth principles it would be desirable to make a visual demonstration of the action of the controls and the principles of flight, with a moving airplane or airplane model as the central feature. It was this specification which was used in developing the demonstrating model airplane (see Fig 3) for the Curtiss-Wright Flying Service schools This fundamental specification was amplified by several additional sub-features It seemed desirable that (1) the model should actually fly, within certain limits, i.e., it should be actuated by aerodynamic forces, (2) the pilot's controls should be full size, and (3) all important dimensions and characteristics should be adjustable, to facilitate the study of the theory of flight

In this device a model of a complete airplane is mounted on a vertical mast, which is part of a parallelogram system anchored to the base The parallelogram arms are counterbalanced so that the model weighs but a few ounces, which constitutes the required lift of the wind forces These are produced by a wind tunnel of conventional design, having an inner cone to eliminate eddies The mounting of the mast is accomplished by a universal swivel joint, so designed that any or all axes can be pinned against rotation Back of the model and its mounting are full-sized controls, stick, rudder,

and throttle The first two are connected through suitable rods and wires to the corresponding surfaces on the model in such a way that the motions of the pilot's controls move the airplane control surfaces but not the airplane The throttle lever is connected to the brush ring of the variable-speed motor which drives the tunnel fan With certain limitations, throttling the wind tunnel simulates the airplane engine

THE methods of illustrating the theorems of flight discussed requires a technique too elaborate to mention here It is easy to see however, the manner in which such a device permits demonstration of the action of the controls, particularly reversals of control in flight and in taxiing, which require explanation to the novice If the instructor puts a new student at the controls of the model and asks him to move the rudder bar so as to turn the airplane to the right in all probability he will rotate the rudder bar to the right, in imitation of the movement of an automobile steering wheel or the front runners of the bob-sled The instructor should show that this movement is incorrect and demonstrate the correct one A case of the reversal of controls such as occurs in taxiing, can also be illustrated on this model To do this instructor should put the model in a banked turn to the right so that it shows how the stick has to be moved in the direction in which the airplane is to turn He should then pin the model against rolling and explain that this brings about the condition that occurs in taxiing, where the weight of the airplane on the wheels prevents rotation By turning the stick to the right and leaving the rudder in neutral position, the instruction should show that the aileron yawing moments turn the airplane to the left, the reverse of what is desired By the use of the rudder he should then show that the rudder yawing moments barely off-set the reverse aileron yawing moments, and the stick must be reversed to make these additive instead of opposing

By turning the model 180 deg on the mast, so that its tail is presented to the wind stream, the instructor should then demonstrate how all the controls except the ailerons are reversed in taxiing down wind at low speed

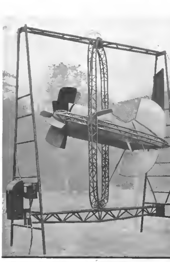


Fig 5 The 'Flight Tutor," developed at Wright Field by W E. Huffman

THERE are several other groups of facts in aerodynamics which cannot be easily explained to the novice without the aid of similar demonstration apparatus. One of these groups concerns the nature, cause, and cure of spins To the engineer well versed in theoretical mechanics, the phenomenon of autorotation presents no mystery, and is easily explained by the relation of the direction of the total air reaction and the instantaneous position of the axis of rotation of the airplane Without this background, however, the student can scarcely grasp the significance of the principles For this reason models were developed, which, when used properly in a wind stream visually illustrate the flat spin The technique consists in showing progressively the autorotation of a wing alone a complete airplane with insufficient vertical surface and an airplane with large enough vertical surface to prevent autorotation

It is difficult for the nontechnical student to realize that "tail spin" is in a sense a misnomer It is not even necessary that the empennage controls be used to put the machine into that condition; a gust may do so and when once started, the tail surfaces resist the rotation It

might be more properly called "wing spin." A demonstration with these models will show the true situation

It is not practical to demonstrate the normal spin, as the apparatus is too complicated for ordinary work The flat spin, though an extreme case, is easier to demonstrate The instructor should be careful to point out the fundamental difference between the two types of spins i e, that in the normal spin the proper rudder control movement will usually stop the rotation by increasing the resistance moments, while in the flat spin the movement of the rudder does not increase the resistance nor reduce the rotation perceptibly This furnishes a good opportunity to call attention to the danger of allowing an airplane to rotate too many times in a normal spin and to approach the flat spin state, as some airplanes will do

It has been customary in many ground school classes in aerodynamics to focus the attention of the student on the properties of airplane wings, rather than on the foregoing rules of flying, which are believed to be of more value to the pilot. If, however, it is desired to give the prospective flier some idea of airfoil properties, a slightly different procedure than that which has been used in the past might well be followed

For one thing, it is not good pedagogy to teach the student that there are two forces acting on the airfoil—lift and drag It is just as easy to give the correct explanation, which is that there is one resultant of the infinite number of pressure and friction forces due to the movement of the air past the airfoil—a total air reaction It should then be explained that the components of this force, perpendicular and parallel to direction of motion of the air, are called lift and drag, but this is merely an arbitrary resolution, especially convenient in wind tunnel measurement In the case of the propeller, the total air reaction is resolved into the planes of torque and thrust A proper conception of the total air reaction is important to the flier, however, only because of the understanding it gives of the stability of the wings and of the airplane With this in mind the student can grasp the real significance of the "center of pressure," which is an arbitrary method of locating the "line of action of the total air reaction" The instructor should be careful to point out the forward unstable movement of the "center of pressure" at low angles of attack and make clear the dangerous tendency of some airplanes to resist being pulled out of a steep dive

To bring out these rather abstract ideas some mechanical device is needed The special airfoil balance of Fig 4 was developed for this purpose It is an adaptation of the principle used in the balance developed by Orville Wright, and permits the simultaneous indication of the three quantities: (1) Total air reaction, (2) drag-lift angle, and (3) center of pressure With a device of this character the instructor can show the difference between stable and unstable airfoils It is possible with these demonstrations to indicate clearly why a low center of gravity will not produce stability.

In presenting the rules of flying to the student flier, operation in calm air is necessarily assumed The student should also be informed of the disturbances in the atmosphere, and the way in which these disturbances affect flying Many accidents could be avoided by a commonsense use of meteorological knowledge.

In view of the fact that meteorological knowledge, as well as general flying technique, is of such vital concern to the beginner, the writer believes that the private pilot should be examined in this subject, as well as in Air Traffic Rules, before being granted his license

Judging from the numerous methods of shortening the time required for flight training which have been proposed, it is evident that training methods should be the subject of scientific research More logical sequences of flight maneuvers and devices to be used as substitutes for the airplane itself should be considered One of the first mechanisms developed to aid training was the "Orientator," invented by Mr Ruggles, to be used by military surgeons in the examination of student aviators This device consists of an airplane cockpit with controls mounted so as to be free to rotate about any of its three axes The motion is produced by servo motors, which are controlled from both the rotating cockpit and a stationary cockpit outside the machine From either cockpit the machine can be put through all the motions of flight which can be stimulated at a fixed point The instructor can thus illustrate flight maneuvers and then allow the student to duplicate the maneuvers The main disadvantages of this machine is its artificial action.

A modification of this machine was developed at Wright Field by W E Huffman It is known as the "Flight Tutor" (Fig 5) It is similar to the Ruggles machine in its method of suspension, but the method of control is radically different The central mechanism is a miniature airplane A large propeller driven by an electric motor is located at the nose on the inner suspension ring Ailerons are fitted on the side of the body, and rudder and elevators are fitted at the rear The blast from the propeller is of such velocity that the normal movement of the controls brings about movements of the airplane which correspond approximately to the motions of an actual airplane The "feel" of the controls is also quite similar to that of the controls of a full-sized airplane. With this apparatus it is possible to execute banks and turns, loops, rolls, and any combination of these maneuvers The main disadvantage of this device is that the wind interferes with its operation unless the machine is housed.

At the present time the glider is being considered for use in primary training and is receiving wide publicity in scientific and popular literature. Numerous aviation authorities are sponsoring the revival of both the soaring and the primary glider as a means of sport and training Soaring is, of course, primarily a sport one that may rank with polo and mountain-climbing for thrills and interest, but requires a well-trained pilot, and thus is no factor in early training The value of the primary glider has yet to be determined

In view of the fact that several distinct methods of training are being investigated, it is impossible to predict what the ultimate form will be, or how quickly and cheaply it may be effected A reduction in time and expense to the point where a flying course can be included in the purchase price of the airplane depends upon the improvement of the airplane, as well as of the system of training The problem of modifying the airplane is two-fold the operation must be still further simplified and the safety of flight must be increased Much progress has already been made in this direction by marginal changes in the airplane structure. The spectacular performances of some of the entries in the Guggenheim contest indicates that the desired goal is already within sight Whether or not radical changes, such as vertical ascent and descent, are necessary to reach this goal is yet to be determined.

THE STORY OF WICHITA

George E Weaver (left) and E. M. Laird and the Laird Anzani plane just before an exhibition flight by the latter at St Paul November 1916

By
John T. Nevill

Detroit Editor of Aviation

Having "pulled out" from Swallow Airplane Manufacturing Company because of Jake Moellendeck's disinclination to accept tubular steel fuselage construction Walter Beech and Lloyd Stearman, late in 1924, rented a small workshop located behind the Broadview Hotel, Wichita, and there began construction of the first Travel Air

Of course, it was not known as Travel Air then, it had no name. It was simply a three-place, open cockpit biplane powered by an OX-5 engine. The name "Travel Air" was suggested later by Walter Innes, Jr, who subsequently came into the company as a stockholder Today Mr Innes is an officer and director of Stearman Aircraft Company

Mr Beech apparently was the prime mover in the new venture Activities were carried on under a partnership agreement, Beech and Clyde Cessna being the partners. Mr Cessna came into the company almost at its inception with a capital sum matching that of Beech Very early in 1925 about the time the first plane was completed, Mr Beech and his associates became badly in need of monetary resources with which to continue operation. So it was decided to enlist additional capital and form a corporation

On Feb. 5, 1925, the Travel Air Manufacturing Company came into formal existence, with Walter Beech, Clyde Cessna and Lloyd Stearman among its group of principals. Beech and Cessna concerned themselves mainly with the business and field work, while Stearman was left in charge of design Among the group of shareholders who became interested in the company as the stock was disposed of, were Jack Turner, Thad C Carver, of Pratt, Kan, Daniel C Sayre, of Boston (now a member of the aeronautical faculty at Mass. Institute of Technology), and George Siedhoff. Many of the early shareholders are still financially interested in the company

The year, 1925, was not many weeks old before another development was taking place that was to mean a lot to Travel Air's future. It seemed that there was no legislation in Kansas permitting a city to own land outside of its own corporate limits So a large group of Wichita's business and professional men, each with some appreciation of what the future held, with the cooperation of the Wichita Chamber of Commerce formed what they called the Booster Building Associa-

This article is the last of a series of three dealing with the interesting aeronautical history of this mid-western city which has produced approximately one-fourth of the commercial airplanes manufactured within the United States. The third article is scheduled for an early issue.

tion. The Association then purchased 160 acres of land bordering Central Avenue, east of the City, at $200 per acre. This property was fenced, and within a short time was equipped with night lighting facilities, the owners' purpose being to hold the site until such time as the city could legally purchase it.

Thus it was that soon after the company had gone "into production" on the three-place, open cockpit biplane, Beech and his financiers were induced to purchase 11 of the 160 acres to build thereon their first factory.

CAME the summer of 1925, which, from a chronological standpoint, is the proper time to introduce another young man who has since become a potent figure among Wichita's four largest airplane plants. Meet Mac Short. J. Earl Schaefer, Stearman salesmanager, says of Mr. Short that today he should be 32 years old, and *would* be—if he had not lost a year "because he was sick." Anyhow, Mac was born in Salina, Kan., in December, 1897. When America entered the World War, he, like Lloyd Stearman, was a student at Kansas State Agricultural College. Also, like Mr. Stearman, he quit the campus for the clouds, choosing, however, the Army Air Service, rather than that of the Navy. Ground school at the University of Illinois. "Time" at Love Field, Dallas, Tex. More "time" at Ellington Field, Houston. Finally, assignment to a bombing squadron. The Armistice! Back to "civvies," and to K. S. A. C. for completion of mechanical engineering training. Three more years of school, barnstorming between terms. Graduation in 1922. Air mail for a few months, then Junior Aeronautical Engineer at McCook Field. October, 1924. Entered aeronautical engineering department, Massachusetts Institute of Technology, from which institution he graduated with a Master's Degree in June, 1925.

During the summer of 1925 Mr. Short returned to Wichita to get some practical experience in airplane construction. He sought a position with the embryonic Travel Air Manufacturing Company, and obtained it, working shoulder-to-shoulder with Lloyd Stearman in designing those early Travel Airs.

From Sept. 28 to Oct. 3, 1925, the new Wichita company had three Travel Air biplanes, one piloted by Walter Beech, participating in the first annual National Air Tour, then known as the Ford Reliability Tour. This helped from a sales viewpoint, with the result that by the end of that year the company had built and sold approximately 19 ships.

This production—19 ships—was increased to 46 ships during the following year. During 1926, incidentally, the company's products, which were all open cockpit biplanes, won some additional honors in the competitive field, notable among such events being the Second Annual Ford Reliability Tour, which Beech won, and the "On-to-Sesqui" race to Philadelphia held preliminary to the National Air Races in that city. The late Fred D. Hoyt, Travel Air dealer, of Eureka, Calif., won the latter event by flying from Eureka to Philadelphia, 2,558 miles in 31 hrs. flying time.

By the time of the second annual reliability tour, however, a new development had sprung from Travel Air. In the fall of 1925 Mr. Short had returned to M. I. T. to become assistant to Prof. Edward P. Warner, present editor of AVIATION, who then was head of the aeronautics department of that institution. When, in 1926, Prof. Warner was appointed Assistant Secretary of the Navy for Aeronautics, Mr. Short assumed a portion of Mr. Warner's former duties. Meanwhile, in Wichita, upon persuasion of Mr. Hoyt, Lloyd Stearman left Travel Air, going to Venice, Calif., where he and Hoyt organized the original Stearman Aircraft Company. It was on Oct. 1, 1926, that Stearman Aircraft Company—the third of Wichita's "four horsemen" of the air—sprang into existence. Mac Short, who was interested in the new company from the start, actively joined the group upon completion of his school year, and assisted in engineering the first Stearman biplane.

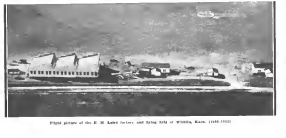
Forgetting Stearman for the moment we will return to Wichita and to Travel Air. Clyde Cessna and Walter Beech were beginning to openly disagree as to superiority of type. Mr. Cessna, always a supporter of the monoplane, favored concentrating upon that type. Mr. Beech favored the biplane. Toward the close of 1926, or so they say in Wichita, Mr. Cessna, outside the factory and at his own expense, built an Anzani powered monoplane to satisfy his own desire. Then followed a second one, Whirlwind powered. The following July this ship manned by E. L. Smith and Emory Bronte became the first *commercial* airplane to fly from California to the Hawaiian Islands.

Just a few months previous to the Smith Bronte flight in April, 1927, Mr. Cessna left Travel Air, and organized the Cessna Aircraft Corporation, heading the organization himself. During that summer Victor H. Roos, formerly of the Bellanca-Roos company, of Omaha, builders of Anzani powered monoplanes, became associated with Cessna, whereupon the firm became known as the Cessna-Roos Aircraft Corporation. However, only a few weeks later Mr. Roos withdrew, later to become general-manager of Swallow, and on September 8, 1927, the present Cessna Aircraft Corporation came into official being.

NOW that we have pictured the manner in which each of Wichita's four largest airplane manufacturers came into existence it will be best, for clarity's sake, to follow the growth of each of them individually.

Shortly after Beech and Stearman left Swallow, C. L. Laird, Matty's brother, designed the Super Swallow, a three-place open job, equipped to take either the OX-5 or the Hisso. About 30 of these ships were built. Then came the F-28, of the same type, but stressed to take any power plant up to 225 hp. November, 1926, rolled around and found the little business going good. C. L. Laird left the company that month to build airplanes "on his own." He built the Laird "Whippoorwill" but experienced hard sledding, financially, and went under. Waverley Stearman took Laird's place as designer in the Swallow plant. Then came a bad mis-step, resulting in an awful tumble.

Early in 1927, you will recall, the $25,000 Orteig prize was tantalizing airmen and airplane builders all over the country. Lindbergh won it in May. A most tragic orgy of trans-oceanic flight attempts begin. Some airman succeeded, more died. After Lindbergh came Chamberlin. Then in June Maitland and Hegenberger, Army fliers, flew to Hawaii, meanwhile Byrd flew to France. In July Smith and Bronte successfully rearhced the Hawaiian Islands, first commercial pilots to do it. Their plane was Cessna-built; built in Wichita. James Dole, Hawaiian pineapple producer, had offered a handsome cash prize to the first commercial pilot to fly from the west coast to Hawaii. Smith and Bronte had made their flight too soon to be eligible.



Flight picture of the E. M. Laird factory and flying field at Wichita, Kans. (1919-1922)

Dozens of ambitious glory-seeking pilots were preparing for the Dole flight. Capt. William Erwin, of Dallas, an old-time friend of Moellendeck's, was one of them. Swallow was doing nicely when Capt. Erwin came to Wichita and asked Mr. Moellendeck to build the "Dallas Spirit." That was in June, 1927.

Figuratively, old Jake Moellendeck glanced over his list of unfilled orders, and stroked his chin. Let's see . . . Cessna had just completed a monoplane, and folks were whispering that it was to be used for trans-oceanic purposes . . . Other whispers were to the effect that Travel Air was also building one . . . What if——

So Moellendeck's order went out. All scheduled production was stopped, shoved aside. Everybody and everything was devoted to the task of building the "Dallas Spirit." All during July, while dealers fumed and minor stockholders protested, the special job was taking shape. Very early in August the "Dallas Spirit" was completed and Capt. Bill Erwin flew it away to California. By that time of course the flights of Maitland and Hegenberger and Smith and Bronte had taken the "edge" off any glory to be derived from a flight to Hawaii. But the Dole prize was still dangling.

Somehow Captain Erwin did not succeed in getting started with the rest of the contenders on that tragic August 16. He waited. There was another big prize offered for a flight to Japan, he would wait and . . . But in from out on those limitless waters came trouble, danger, death. The following day, away out there on that comparatively infinitesimal island, Oahu, Art Goebel landed his Travel Air monoplane. A few hours behind him came Martin Jensen in his Breese monoplane. Two other planes, one carrying a girl, had started, had not returned to the mainland, had not been seen out there.

Capt. Bill Erwin and his aide, A. H. Eichenwaldt, took off on a brave but obviously futile rescue attempt. Neither Erwin, nor Eichenwaldt, nor Jake Moellendeck's plane have been seen since.

In citing the tragedy of the "Dallas Spirit" it has been far from the writer's intention to disparage either the pilot or the plane. Heavier-than-air ocean flying was at that time, and still is, largely a matter of luck. Goebel and Jensen drew the right cards, Erwin and Pedlar and Frost did not. However the "Dallas Spirit," —its construction, its cost and its end—had a most definite and most unfortunate effect upon the destiny of the Swallow company. And that is where we are concerned.

The debacle of the "Dallas Spirit" ended in a receivership on August 13, 1927. Just previous to this most inglorious business setback, and just before Mr. Moellendeck, overwhelmed by misadventures, was ordered to a hospital, he had sold to a Lincoln, Neb., company the right to manufacture Swallows in Nebraska.

DURING the following November a "purchase partnership" headed by Jack Turner, vice-president of Travel Air, took over and reorganized Swallow. Under the re-organization Mr. Turner become president, J. W. Craig, vice-president, C. A. Noll, second vice president, W. M. Moore, treasurer, and W. B. Harrison, secretary. In January 1928 the Swallow plant was enlarged, the production schedule stepped a bit, and Victor H. Roos was appointed general manager. The "Super-Swallow" became the "Swallow" and the business again began to gather momentum. Toward the close of that year Swallow developed the well known "TP", a two-place, training plane designed for an 80 to 100 hp. engine. M. D. Kirkpatrick, Swallow factory superintendent, Dan Lake and K. O. Jentsch of the company's engineering staff, were credited with the "TP" design. It was during this time, incidentally, that another reorganization took place. In November Mr. Roos left, going with the Lincoln-Paige Company, of Lincoln, Neb. He was succeeded by George R. Bassett, receiver.

Throughout 1929 Swallow had in production only the three-place open regulation "Swallow" and the newly developed "TP." However, last October the company test flew a new four-place low-winged cabin monoplane, carrying a Wright engine of 165 hp. This plane at present is expected to be added to the production line. Last summer three new buildings were added to the plant, more than doubling its production capacity. Since the first Laird Swallow was placed on

the market in 1920 the Swallow factory has turned out approximately 500 airplanes—even if the factory wheels have turned under several different banners. The business done by Swallow last year amounted to $560,000, a 15 per cent gain over 1928. Incidentally, the company long since adopted welded tubing for fuselage structure.

After Swallow comes Travel Air. Well, you have been told that Cessna left Travel Air principally because of his preference for the monoplane type. You also have been told that Col Arthur Goebel flew a Travel Air monoplane, "The Woolaroc," to Hawaii. During the latter half of 1927 Travel Air went "into production" in the cabin monoplane field, after having built more than 200 biplanes. Travel Air's total production during 1927, incidentally, was 154 planes, more than three times the 46 craft they produced in 1926.

During 1928 the company's production increase was equally proportionate, being nearly three and one-half times that of the preceding year. During the year, 1928, also, the Travel Air Manufacturing Company was reorganized under a new stock issue, becoming officially known as The Travel Air Company. In December of 1928 the company, then housed in two units on East Central Airport, let a contract for a new $50,000 unit. Scarcely had construction of this unit been started before the company, on January 1, 1929, moved into their new two-story brick administration building. To get some idea as to how well the business was moving along may we cite the figures for March, 1929, during which 31 days Travel Air sold over $300,000 worth of airplanes. By the summer of last year the wave of prosperity had swept the company along so rapidly that it had erected and moved into its fifth unit. Despite this building program figures for the first six months of 1929 show that Travel Air built, sold and delivered a total of 307 airplanes valued at approximately $2,000-000. July found the one-time three-man company employing a total of 650 men and working both day and night shifts. It was during this period that the city of Wichita, having opened its new 640-acre airport south of town, sold the remainder of the 160-acre tract on Central Avenue to Travel Air.

Two rather striking Travel Air developments occurred during the latter six months of 1929. One, announced early in August, gave controlling interest in the Travel Air Company to the newly combined Curtiss-Wright Corporation, the oldest and one of the largest groups in the industry. By terms of the merger 100 000 shares of Travel Air stock outstanding were traded for 175,000 shares of Curtiss-Wright common stock making Travel Air the twelfth unit of the giant combine. Although this move may have detracted something from the pardonable, but un-salable, pride Wichita no doubt had in the "home industry" aspect of Travel Air, it demonstrated the wisdom of those controlling the destiny of the company. More recent developments, particularly the Wall Street debacle and the business depression existent at this writing, bear out that statement.

The second Travel Air development referred to above was technical rather than financial. It was the Travel Air low-winged racing plane, with which practically every pilot in the nation is familiar. This 300 hp. Wright engined "scarlet marvel," as it has been called, has become well-known in the industry since Doug Davis introduced it at the Cleveland Races, and needs no further introduction. However, it would be unfair to Travel Air, to the plane and to Doug Davis, not to mention that it "walked away" with the "free-for-all"—speediest of the Cleveland events. The "mystery plane's" average speed for the 50 mile course was 194.9 mph, the fastest average time ever recorded by a commercial airplane in the United States. It also was the first time any commercial plane ever won such an event over the Army and the Navy. It is expected that the low wing, converted into a sport plane, will be placed in production alongside the company's line of 9 cabin monoplanes and 3 open biplanes.

Figures issued by Travel Air at the beginning of this year reveal that 1929 production doubled that of 1928, approximately 1,000 craft produced, the same valued at $3,500,000. Compare that figure with the paltry $10,000 with which the company began business just five years ago. Walter Beech is still president of Travel Air, as well as being president of Curtiss Wright Sales Corporation. Clyde V. Cessna and Jack Turner, two of the early stockholders, are still vice-presidents. A number of the employes who worked shoulder-to-shoulder with Mr Beech in those days when the monthly rental was an ogre in the offing today occupy lucrative positions either in the company, or in the industry. Think that over.

Now comes Stearman. Lloyd Stearman and his new-born company lasted just about one year in Venice; then financial troubles overwhelmed him. However, his C-1 and C-2 models (the latter of which was being used by Walter Varney) had proved he "had something," so friends in Wichita, headed by Walter P. Innes, Jr, persuaded him to pack up his assets and return to Wichita. Innes had engineered a bit of promotion work, whereby a total of $60,000 was raised by telephone, alone, in one day. So, in November, 1927, the rejuvenated Stearman company began business in Wichita, with Lloyd Stearman, president, Mac Short, vice-president, and Mr. Innes, secretary.

In Wichita the C-2, "cleaned up," and with an increased design load factor, became the C-3, a line embracing various power plants, principal among which was the Wright J-5. The mail carrying models of the C-3-B types, as the Whirlwind jobs are known, have been designated as the C-3-MB, although the only difference is that the two-place forward cockpit has been closed in as a mail compartment. In December, 1928, Stearman came out with the "Speed Mail," officially designated as the M-2, a craft carrying either the Wright "Cyclone" or the Pratt and Whitney "Hornet."

When Wright Aeronautical introduced the new J-6 series, Stearman redesigned and improved upon the C-3-B to take the seven cylinder "Whirlwind." This model now is known as the C-3-R. Previous to this revision the company had introduced its Light Transport, a passenger carrying biplane, equipped to carry four passengers and 500 lbs of baggage or mail. It is powered by a Pratt & Whitney "Hornet." The C-4 line, designed for the 300 hp Wright or the 425-hp "Wasp," followed next.

Stearman Aircraft has never had a policy of concentrating for long on any one model. There has been more of a custom-built, or made-to-order business. This policy notwithstanding, Stearman built and sold approximately $1,000,000 worth of planes during 1929. Their sales for their fiscal year, ending last May, exceeded $1,113,000, leaving a net profit for that period of $65,000. The $60,000 invested by Mr Innes and the rest of Mr. Stearman's friends in need, had, at that time, grown to total assets of over $450,000, all free of indebtedness. And that isn't all. Early last August United Aircraft & Transport Corporation, another of the industry's "big four" groups, announced acquisition of controlling interest in Stearman. United exchanged 26,667 shares of its common stock for 100,000 of Stearman common, an exchange basis of 1 for 3.75. The merger put Stearman on the New York Stock Exchange, which is considerable progress for an organization starting on the proverbial "shoe-string" less than two years before. To be more specific—and this is according to J. Earl Schaefer, Stearman salesmanager,—the present Stearman company was started in November, 1927, "with two lathes, sizes nine and sixteen inches, one 20 in. drill press, five small bench drills, one 8 in. shear, one 4 in. roll, one beader, one perfectly loyal personnel, 15,000 sq ft of floor space in the old Bridgeport Machine plant (leased), and a small bank balance." Today,—well, Mr Schaefer provided the writer with a complete list of the company's present-day equipment, but it is too long to be enumerated here. It might be said, however, that the Stearman plant now covers more than 55,000 sq ft of floor space in three large buildings and the company leases nothing except a flying field. The manufacturing equipment has been increased many times, the plant now includes a modern aluminum and brass foundry, and the company recently completed a modern and spacious hangar on Wichita's new city airport.

As previously related the present Cessna Aircraft was organized Sept 8, 1927, with Mr Cessna as president. Among the company's officers and directors were George H Siedhoff, M T Hargiss, W B Harrison, Henry J Allen, and James P Verts. During 1928 the Cessna company launched actively into production of full cantilever cabin monoplanes, ranging from a two-place to a six-place job. Earl Rowland flew the Cessna into sweeping popularity during the summer of 1928 when he led all entrants in the class A derby to the Los Angeles air races. During 1928 Cessna built approximately 50 planes—a remarkable record for any company's initial year.

In February, 1929, Cessna contracted with the Curtiss Flying Service to handle all sales. This contract was terminated last January 1. The Cessna company originally operated on a small site, well within the corporate limits of Wichita. Early in April, 1929, however, Major Howard V Wehrle, general manager, announced that a contract had been let for construction of a six unit factory on a newly acquired 80 acre airport near the Wichita Municipal airport. The building was to cost $200,000 and would give Cessna approximately 55,000 sq ft of floor space, as compared with 18,000 sq ft available in the downtown site. It was about this time that the Cessna company was refinanced by a group of Boston, Mass, bankers.

During June, last year, the company moved into the new plant and announced that they were undertaking a production calling for construction of 545 planes during the balance of the year. Practically all of these were required to fill the Curtiss contract. Because of market conditions developing during the latter half of the year, no such ambitious program was carried out. Cessna, like several of the other larger companies in Wichita saw the peak production of its career thus far during the profitable months of the summer of 1929. It was then that the company was employing as many as 220 men and working night shifts. But the business depression and the winter months set in to force the entire industry to throttle back, retrench, conserve resources, and prepare for the opening of the coming season.

Now there is considerably more to Wichita's aviation industry that just Swallow, Travel Air, Stearman and Cessna. Nothing has been said of Swift Watkins, Buckley, Braley, Knoll, Sullivan, Mooney, Yunker Metal Aircraft, Wichita Airplane Manufacturing, or any of the several other smaller companies that appeared in the Witchita field during the past two years. Some have passed, some survive. Neither has mention been made of the city's six experimental engine factories, its airlines (including T A T, Western Air Express, Universal, and National Air Transport), its 13 aeronautical schools, its 25 or more aeronautical accessory houses, its seven service depots, or any of its various organizations devoted to the furtherance of aeronautics. These organizations—all of them—have played some part in the aeronautical picture in Wichita. Some of them have merely appeared, become active for a time under the soothing, life-giving warmth of general prosperity, then disappeared into either hibernation or extinction. No doubt, as time passes, some of them will emerge from hibernation to be heard from by the industry, possibly to occupy niches in aviation such as those being graced by Travel Air, Stearman or Swallow. Let us hope so.

An air shot of the original Wichita, Kans., field established by the Wichita Aircraft Co

Shop Notes and Technical Data

THE PRESENT STATUS OF AIRCRAFT ENGINE SUPERCHARGERS

By S. Paul Johnston
Aeronautical Engineer

DURING the past few months there have been indications of a growing appreciation of the advantages to be derived from aircraft operation at higher altitude. This has undoubtedly been brought about by the increasing use of superchargers on airplane engines While the supercharger is usually thought of as a device to provide sea level engine power at the higher altitude, there is a frequently forgotten application that is nearly of equal importance This is the possibility of using the device to supply air to the engine at a density greater than that of sea level making it possible to increase the output under sea level operating conditions This application therefore makes possible an increased output from a given engine or conversely the possibility of using a smaller engine to develop the same power as one without a super charger. In any event, low altitude supercharging when used with discretion, affords a means of providing a degree of reserve power which may be put to a variety of purposes by the aeronautical engineer

There are however certain limitations to the degree of low altitude supercharging and these depend directly on the inherent characteristics in the design of engine to be supercharged. In some cases this limit is detonation and in others general durability In the latter case it is advisable to use the supercharger only in emergency or at takeoff when a certain reserve power is required When this is done the engine throttle is usually fitted with stops so that the pilot will not open it completely without a conscious effort There are also other limiting factors in the matter of sea level supercharging

An engine without a supercharger will operate at full throttle a given number of hours without overhaul If this engine is supercharged so as to increase its sea level power 10 to 30 per cent and if the engine is then operated at full throttle at sea level certain parts may fail, so as to decrease the time between overhauls However these parts can be found and strengthened Thus with comparatively little work there is obtained a supercharged engine which delivers 10 to 30 per cent more power than the original engine with the original durability with comparatively little increase of weight and cost This sort of development has been completed or is under way with a number of engines

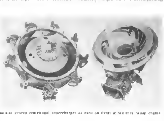
Commercial superchargers of the present period may be divided into two general classes, the centrifugal compressor type and the Roots blower or positive pressure variety Both of these types in their commercial adaptation are gear driven, but for military work, where high altitude operation is the primary consideration, an exhaust driven centrifugal compressor type has been developed and is in general use

Because of the characteristics inherent in the designs of the commercial type, and the engines to which they are applied the geared centrifugal compressor variety is built integral with the engine and the Roots blower and exhaust driven centrifugal types are constructed as separate units At the present time the Roots type is used to a limited extent on engines in the lower horsepower range

Considering first the centrifugal type supercharger which has been developed mainly through the efforts of Dr Sanford A Moss of the General Electric Company in collaboration with the various government services it may be stated that this device is essentially a highly developed rotary air compressor adapted to the needs of aircraft engine supercharging The exhaust driven variety of this type which is previously stated is used mainly for high altitude work in the military and naval services and was the first to be used on an American engine in May, 1918 In the development of the device for commercial use, however and its gradual incorporation as an integral portion of the engine it became more desirable to adopt a geared drive for the general purpose commercial product

The exhaust driven type of supercharger is connected to the engine through the exhaust manifold and the carburetor air intake only It is commonly mounted on the side or immediately in front of the engine. It consists of two essential parts i e a turbine driven by the exhaust gases and a blower driven by this turbine which in turn applies compressed air to the carburetor The turbine wheel has no housing of any kind surrounding it and is located directly in the atmosphere When the engine is in operation at altitude the pressure of the exhaust gases discharged into the manifold is the same as that when operating at sea level The pressure at the turbine wheel is that of the surrounding atmosphere which is considerably below sea-level pressure at high altitudes and this difference in pressure results in the velocity required to drive the turbine wheel The impeller of the centrifugal compressor is mounted on the same shaft with the turbine wheel

For engines designed with built-in geared superchargers portions of the crank case and central castings are arranged to form the parts of the casing for the supercharger The gearing used to drive the magnetos oil pump and starter is rearranged to drive the supercharger There are a number of relatively simple ways of accomplishing this and in most cases comparatively simple changes in the basic design may be made to adapt an engine for a built-in supercharger



Built-in geared centrifugal supercharger as used on Pratt & Whitney Wasp engine

As in the ordinary rotary blower, the basis of both types of centrifugal superchargers is the rotary impeller. Second in importance is the diffuser, which in the built in type, is a part of the engine.

The ratios of crank shaft speeds to impeller speed are relatively high in some cases, ranging from one to five up to one to fourteen The difficulties encountered in early geared drives, particularly those of acceleration and deceleration stresses, have been eliminated by careful design and improved material and the reliability of a modern built-in supercharger is virtually equal to that of the engine itself

The impeller is designed so as to have exceedingly low inertia in order to minimize the gear stresses In some cases no clutch is necessary, but in others it has been necessary to install an automatic device designed to slip a little in starting and stopping Use of a clutch is becoming more common as supercharger speeds are being increased.

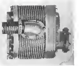
The casing in which the impeller rotates and the diffuser beyond the impeller are formed by the engine casting with comparatively little increase in weight. The diffuser leads into an annular passage from which are lead pipes to the inlet valves of the various cylinders. Air leaves the impeller with a high velocity (500 to 1,500 ft. per sec) which is practically equal to the peripheral speed of the impeller There is an appreciable increase in pressure at the impeller exit due to centrifugal effect and the velocity of the air represents a certain amount of kinetic energy which at that point is not in useful form

In order to convert this energy into pressure, the air is discharged from the impeller tips into a carefully designed chamber which is called the diffuser The diffuser is so shaped as to reduce the velocity with the minimum loss and convert the velocity into pressure The pressure at the diffuser exit is appreciably greater than the pressure at the impeller exit The efficient conversion from velocity to pressure energy requires careful attention to the design of the diffuser and other air passages Two types of diffuser have been developed—one with blades, and one without blades Circumstances dictate the use of one or the other type

It is obvious from the foregoing that all of the parts of a built-in supercharger system are integral with the engine, with the single exception of the high speed impeller This unit also requires most careful attention to its design and construction For these reasons the impeller is the only part of the entire supercharger equipment which is supplied by the General Electric Company the other units, including air passages and piping, shafts and gearing diffuser, controls etc., being supplied by the engine manufacturer During the course of a given engine design very close contact is maintained between the two organizations involved The impellers and engine parts are then held to very close tolerances during the course of manufacture, and no difficulty has ever been encountered in obtaining the exacting fits required to insure proper assembly of the impeller in its housing

The impellers are machined from heat treated, forged aluminum alloy blanks These blanks are forged as nearly as possible to final shape, and are then milled by special machines to give the proper thickness of blade Heat treating and aging are interspersed conveniently in the manufacturing process All steps in the process are subject to the most rigid control and inspection In order to meet the exacting requirements of this work, the General Electric Co , has organized a special department where the work is carried on by a staff of machinists, inspectors, and engineers. The theory of centrifugal superchargers has been discussed in some detail in an S A E. paper on the subject by Dr Moss

Following another line of development which can be traced to the automotive field is the Roots or positive pressure type supercharger represented by the DePalma which has been manufactured by the American Cirrus Engine Company for use in connection with its vertical and inverted-in-line engines As previously mentioned this is a separate unit and is gear driven In general design it conforms with the normal Roots blower which has been described in some detail in N A C A Technical Report No 230 A more recent report No 355, of the same organization deals with comparative tests of the Roots and exhaust driven centrifugal types.



The DePalma supercharger of the "Roots" or positive pressure type

It has been successfully demonstrated that there are definite advantages to be gained from supercharging engines for use at altitudes of 10,000 ft. or less. Improved performance is available with little if any, sacrifice of weight, size, or specific fuel consumption, and at a relatively small increase in first cost.

One other point is worthy of note in closing Tests recently conducted in the marine field have shown that Diesel engines are capable of being supercharged to a much higher degree than are Otto cycle engines Marine Deisels have had their power output increased 40 per cent by supercharging If oil engines are to become common, then there is truly a still greater field awaiting the supercharger manufacturer

DETERMINATING THE PARASITIC DRAG OF AIRPLANE TIRES

By C H. Martens
Aeronautical Engineer,
Firestone Tire and Rubber Co

THE parasitic drag of airplane parts is now attracting greater attention than ever before not only because of the constantly increasing demand for higher airplane speeds, but also on account of the imperative need of better operating economy at present speeds The drag of airplane tires has long been generally recognized as an important item in total airplane drag but only recently has any attempt been made to lower the specific tire drag

Up to the present time stream line fairings have been the most generally used means to reduce specific tire drag Most of the fairings employed have aerodynamic merit but they also add to airplane cost make tire servicing more difficult, set up interference drag with the rest of the landing gear, and are always in danger of fouling when landing in muddy fields If part or all of these tire fairings could be eliminated without sacrificing airplane performance a forward step in airplane design could be made The development of an airplane tire of the correct aerodynamic form to reduce parasitic drag is of considerable importance

The correct aerodynamic form of airplane tires and the reduction of specific tire resistance can be obtained only by painstaking investigation and development on the part of the airplane tire manufacturer Strength, shock absorbing qualities and safety are not to be sacrificed to secure reduced tire drag Modern airplane operating conditions demand that an airplane tire must possess the best obtainable aerodynamic form for its load carrying class without loss of strength shock absorbing qualities or safety

The Firestone Tire & Rubber Company recently conducted an investigation to determine the drag characteristic of several airplane tires, in order to obtain data to aid them in the development of a

line of airplane tires of low specific resistance. The tests necessary for this investigation were carried out in the wind tunnel of New York University. All tires tested were of the class used interchangeably on planes of 2,000 to 3 000 lb gross weight. Each tire was mounted on a standard commercial streamlined wheel of the best obtainable aerodynamic form. All tire and wheel combinations were mounted on a strut which was a full scale reproduction of the one used on a commercial airplane. All tires tested were of the plain tread type.

Except when special strut clearance tests were being run, the tires were mounted with approximately the same strut clearance as was used in commercial operation.

The following nominal size tires were tested: 9 00-6, 30x5, 7 50-10, 28x4, and 22x10-4. The 9 00-6 tire was tested at ½-in, 1-in, 1½-in, 2-in. and 3-in strut clearances. The other tires were run at the strut clearances shown in Table I. The 9 00 6 tire is listed in Table I at 1½-in strut clearance, since that was found to be the position of minimum drag. All tires were tested at 40, 50, 60, 70, and 80 m p h air speed. The drag of the strut and necessary tunnel wiring was determined at each air speed at which tests were to be run. All drag results presented are net results of tire and wheel. Results obtained in this manner compare with actual operating conditions in the closest possible way and take full account of any interference that may exist between tire and strut. Had the tires been run without the strut, there would have been no way of evaluating the induced drag. A test was run at all air speeds on the 9 00 6 tire with a fairing near the tire removed, and a test was also run with faired strut but with inflation pressure reduced. Typical drag curves are shown in Fig 1.

The effect of strut clearance on tire drag at 80 m p h for a 9 00 6 tire is shown in Fig 2.

Fig 3 shows the effect of fairing on drag. Drag values and coefficient obtained at 80 m.p.h are shown in Table I, along with certain characteristic measurements of the tires tested. All coefficients are expressed in engineering units of lb, sq ft, and m p h. The basic formula being Drag = AD_cV^2

The fair D/V^2 curves resulting from all tests show that no critical air turbulent period existed in the range investigated. The 9 00 6 tire strut clearance may be anywhere between 1 and 2 inches without appreciably effecting air plane performance. There is every reason to believe that the other tires tested would have a comparable range of working strut clearance. It is believed that the increase in drag noted with increase strut clearance is due not so much to tire strut interference as to the additional length of axle necessarily interposed between tire and strut.

The lowering of the inflation pressure on the 9.00-6 tire had no discernible effect on drag, since the outside diameter was not measurably affected and its section diameter changed less than ⅛ of 1 per cent. The unfaired strut near the tire showed a marked increase in drag which would result in a decreased plane performance. The bare strut test should serve as a further warning against use of unfaired members in landing gears.

Table I—Observed Drag of Airplane Tires in Presence of Strut

Nominal Tire Size	Strut Clearance, In.	Actual Outside Dia., In.	Actual Section, Inches	Actual Projected Area in Sq.Ft.	Observed Drag in Lb.	$D \div V^2 \times 10^{-4}$
9 00-6	1½	22 66	8 90	1 41	6 95	7 76
30x5	2	29 52	4 91	1 01	6 90	12 46
7 50-10	1½	23 75	7 76	1 28	6 61	8 05
28x4	2	27 71	4 66	0 77	6 80	13 00
22x10-4	1½	21 43	9 37	1 59	7 03	7 92

The general conclusion therefore, is that the low pressure tires present about equal or even slightly smaller parasitic drags than the corresponding high pressure tires capable of the same structural loadings. Or in more detail, the flow about such a tire is enough smoother to compensate for its larger cross sectional area. It is also obviously poor practice to attempt to use any single average resistance coefficient for both classes of tires, although an average for each class is possible.

This general conclusion that low and high pressure tires can be used practically interchangeably as far as aerodynamic performance is concerned, is further checked by the results secured at Langley Field during the full scale tests of the drag of the Fairchild FC2W2 which were published in Technical Note No 340, no difference being detectable in the landing gear drag when the two types of tires were interchanged.

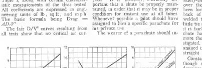


Fig 1: Observed drag on 9 00-6 air balloon plain tread tire at varying speeds at 1½-in strut clearance. Fig 2. Observed drag on 9 00 6 air balloon plain tread tire at 80 m.p.h air speed. Fig 3 Observed effect of strut fairing on drag 9 00-6 air balloon plain tread tire at varying air speeds at 1½ in strut clearance

CARE AND MAINTENANCE OF PARACHUTES

By Lloyd Graham
Irving Airchute Co.

THE average user of a parachute has little or no knowledge concerning its construction and theories of operation, nor is there any great need for his having much information on these subjects. It is however, extremely important that a chute be properly maintained, in order that it may be in proper condition for instant use at all times. Whenever possible a pilot should have assigned to him a specific parachute for his private use.

The wearer of a parachute should inspect the rip cord pins frequently, and see that the safety-tie has not been disturbed. In a case where more than one pilot is wearing the same parachute it is well to be doubly certain of this. The safety-tie is the thread which is looped over the end of the pin, after it has been locked in place, and is tied just back of the point where the pin is welded to the rip-cord cable. If this little tie is found broken or out of place, it is fairly good evidence that the parachute has been tampered with, and a more thorough inspection should be instigated. The pins also should be examined to be sure they are smooth and straight.

Constant wearing of a parachute, even though no use is made of it, causes deterioration. Each parachute should be shaken out, aired, inspected and repacked once each month. After the canopy has been shaken out and inspected, it should be hung up by its peak for six or eight hours.

It is extremely dangerous to leave a parachute anywhere near moisture, particularly in the vicinity of salt air. If a pilot must drop one on the field or hangar floor he should be careful that the spot picked is not muddy or

wet. Any place where chemical fumes, such as those from storage batteries are present is an extremely bad one for parachutes.

In making tests or live drops a parachute is likely to become soiled, sooty, or marked by grass stains. This does not affect the strength or the life of the silk in any way. It is not recommended that the canopy be washed as it is better to allow the spots and stains to remain in the silk than to subject the whole canopy to the risk of a washing. Any spots caused by grease or oil however, should immediately be removed with carbon tetrachloride, or some similar solvent which will not injure the fabric.

In making a descent one should always avoid allowing the canopy to drag along the ground. To deflate the parachute a firm grip should be taken on the shroud lines extending to that part of the canopy which touches the ground. One must get a firm grip the first time to avoid burning the hands.

When a parachute comes down in water the canopy should be rinsed out thoroughly with clean, fresh water. This is done by hanging the canopy up by the peak, after removing the pilot chute, and spraying the entire canopy with a hose. Allow the canopy to dry as it hangs, under no condition wringing it out. If a parachute has been dropped into water many times, test it to be sure that tensile strength is still up to standard.

In actual use practically all the wear is on the pack. This should be examined occasionally to see that there are no holes or tears in it and that no chaffing has occurred at any point where the silk within might be damaged. When examining the pack, one should also take a look at the locking cones and the grommets. They should be in place, with their surfaces smooth, and no rough edges. It is sometimes advisable particularly in a damp climate, to lubricate these parts with a film of fine oil.

The rip-cord should be examined to see that there are no broken or frayed strands in the wire cable. These have been known to appear when the cable enters the flexible metal housing at an angle.

The flexible metal rip-cord housing is anchored to the left flap of the seat pack with six turns of eight cord linen thread, doubled. It is similarly anchored to the left strap of the harness just above the pull ring. Since it is a function of this housing to prevent snarling and accidental release under all conditions, it is well to see that it has not become bent or crushed at any point. Care should also be taken to ascertain that any tension applied to the rip chord housing, or to the harness, will not be transmitted to the rip chord.

After the parachute has been packed, the rip chord can be placed in its normal position with the pull ring in its pocket. Using one hand to steady the pack, the harness should be jerked in various directions to be sure that accidental release does not occur. Lifting the parachute by the rip chord housing should produce no tendency of the cord to draw from the cones.

On all types of parachutes, elastic cords are provided to pull the pack open. It is recommended that these elastics be discarded every six months and new ones put in their place.

Whenever the chute is to be left idle for several weeks, it is good practice to open it, and release the canopy. The canopy should then be rolled up and placed in a clean, dry storage place, where the temperature is moderate. With a slight amount of care, canopies will last for many years.

In carrying a parachute, always take care to lift by the side or leg straps, rather than the webbing straps at the back. In inspecting the canopy, one should go over each seam and every inch of the fabric to be sure that there are no weak spots.

New Equipment

THE NORTHROP "ALPHA"

INTRODUCTION of the Northrop "Alpha" seven place low-wing all-metal cabin monoplane has attracted attention in the aviation industry due to the unusual type of wing structure employing flat sheet dural throughout. Aerodynamically the plane is similar to a number of other low wing cantilever monoplanes already on the market. Structurally it presents a radical and promising innovation.

In the wing the flat sheet covering not only carries the drag load, but also the major portion of tension and compression loads normally carried by spar cap strips. The structural form is multicellular, the cells being of rectangular type. While the top and bottom sides of these cells, being portions of the top and bottom surfaces of the wing, are of continuous sheeting, the vertical members are all lightened to a truss form. The average spacing of vertical rib members throughout the wing is 24 in, and the average spacing of the vertical spar members is 12 in. The spacing of the vertical members, or dimensions of the individual cells, varies with the load imposed, as does the gage of the metal employed. Also the flat sheet covering is suitably reinforced at various points by angle or channel members riveted directly to the skin and parallel to the vertical spar members.

As a result of its structural efficiency which permits more nearly full employment of all of the material used in the wing structure than has been obtained in more conventional structures, it has been possible to obtain ample strength with unusually light weight for a cantilever wing. The wing panels weigh approximately 1 8 lb per sq ft. Furthermore, the continuous flat sheet covering gives the wing extreme torsional rigidity, since the metal covering is heavier than in other skin stressed wing structures of conventional type.

In manufacturing a structure of this sort, material savings are effected in a number of ways in fabricating the wing. There are many fewer individual pieces in a structure of the Northrop type than there are in the ordinary wing with spars, ribs covering, and bracing. Many of the units in the Northrop wing are identical and all are of similar form. Every portion of the structure is formed from one type of material, flat sheet dural, and all fabricating is by one process, riveting. Furthermore, all riveting is of the exposed type as the wing is built up, facilitating rapid and efficient assembly. Hand measuring, forming, and fitting is largely eliminated since the metal parts in the Northrop wing are largely formed by pressing or stamping from flat sheet, and much of the hand work involving the use of patterns, rib and spar jigs, etc, is eliminated.

Each wing panel is assembled complete in a master jig. The fuselage is built in two halves, divided longitudinally, and is then assembled. Complete jig and die equipment for all processes of manufacture of the "Alpha" model have been provided by the Northrop Aircraft Corp in its Burbank factory so that very real savings in manufacture can be effected if these planes are produced in quantity.

The Northrop "Alpha" is a Wasp Series C powered light transport low wing cabin monoplane. With a span of 41 ft. 10 in., length of 28 ft. 4½ in, and height of 9 ft, the Alpha has a weight empty of 2,500 lb and gross weight loaded, of 4,300 lb. Total wing area is 295 sq ft, the chord varying from 100 in at the root to 66 in at the wing tip taper being present in both plan form and thickness. The dihedral angle of the wings is 3½ deg. Airfoil section is the Clark-Y curve, somewhat modified by thickening up toward the root for structural purposes. The engine is mounted in an N A C A cowling and the entire fuselage, which is circular in cross section presents an almost unbroken streamline from nose to tail. Six passengers are carried in the cabin. The pilot occupies an open cockpit in rear of and above the cabin, which may be entered either through the cabin or from the outside. Finish may be either natural duralumin, or any desired color

combination by lacquering direct on the metal

Ailerons employ the same structure as the wing, are of narrow chord, approximately 12 in., and extend two thirds of the length of each wing panel from the detachable wing tips, which serve to shield each aileron Attached along the upper surface by a continuous piano type hinge, and with the lower slot shielded by a flat metal plate, the ailerons are differentially controlled having a travel upward of 20 deg and downward of 10 deg Operation is by means of cables from the cockpit to a lever arm within the wing and through a push-pull tube to an internal horn on the aileron.

Wing aileron, and empennage structures are treated internally with Lionoil and are either left untreated on the outside or painted with Duco

Of circular cross section, the fuselage incorporates a carefully developed streamline form fore and aft. Construction is by means of a series of longitudinal gores of flat dural, one side of which is crimped over to provide longitudinal stiffness. These gores are riveted to each other and to round dural bulkheads of U channel section, thus forming a smooth monocoque body. The center section is built into the fuselage, with certain additional bracing, and some bracing is also provided around the cockpit, door, and window cut outs. Aluminum alloy castings are used in all fittings where loads are uniform, while engine mount, and landing gear fittings are of built up sheet steel. Wherever steel fittings are used a thorough treatment of Lionoil is provided between the steel and the duralumin to which it is attached

The engine is carried on a welded chrome molybdenum steel tube mounting with a four point attachment to a heavy master ring of cast aluminum alloy which is riveted into the forward end of the fuselage structure. Live rubber bushings are provided at each of these four points of attachment

A heavy duralumin fire wall with demountable center panel for reaching engine accessories from within the cabin, is built into the forward end of the fuselage at the point of engine mount

The Wasp powered Northrop "Alpha" low wing monoplane

attachment The cowling is built in three sections and is attached with quick acting clamps. There are no inner baffles although the inner cowling is of special form to provide good cooling. Under test it has been determined that engine head temperatures never normally exceed 400-440 deg. F The engine turns a Hamilton-Standard propeller of 9 ft dia and 19 deg pitch at the 42 in. station. Exhaust gases are carried to a bayonet silencer and heater beneath the fuselage by means of a collector ring under the cowling. All oil and fuel tanks are of aluminum riveted and welded construction and are manufactured in the Northrop plant Fuel is carried in three banks of two tanks each carrying a total of 116 gal, located in the right and left center section wing stubs and beneath the cabin.

Empennage members are of the same type of construction as the wing and are of cantilever type.

The landing gear incorporates ring spring and also shock absorbers on all three wheels Tread is 8 ft. 6 in Bendix wheels and brakes are standard equipment Braking is provided by a hand lever working on both wheels equally, and by means of individual differential controls on the rudder pedals The tail wheel is ten by three in., equipped with oleo shock strut and pneumatic tire and swivels through 360 deg

The pilot's seat is of seat pack parachute type, aluminum construction, and is adjustable for height A dural instrument panel equipped with Pioneer instruments throughout is carried in special spring and rubber mountings which render it unusually free from vibration

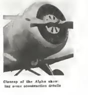
Entrance to the main cabin is gained by means of a wide walkway on the right wing stub and through a door at the right rear of the cabin The main cabin is 110 in. long, and 52 in high by 55½ in. wide, max inside diameter Six passengers are comfortably seated, either facing each other or all facing front. Glass windows, shaped to the curve of the fuselage are set rigidly in the structure in rubber sockets, and ventilation is provided by special vents The passenger cabin is heated by means of a controllable hot air supply from the exhaust stove Standard upholstery is leather over the seats and mohair on the cabin sides and ceiling

It is of interest to note that the weight of the bare fuselage structure is but 240 lb., and the weight of the entire airplane structure, without any accessories, is but 1,300 lb, or little more than half of the weight empty when all installations have been completed.

The Northrop Aircraft Corp is a division of United Aircraft and Transport Corp, with the factory and experimental laboratory located on the United Airport Burbank Calif Officers are W. K Jay, president and treasurer, John K Northrop, vice president Tom C McNamee, secretary, and Don R. Berlin, chief engineer

Specifications and performance figures as supplied by the manufacturer follow

Length overall	28 ft. 4½ in
Height overall	9 ft
Wing span	41 ft. 10 in
Total wing area	295 sq ft
Chord—at root	100 in.
Chord—at tip	65 in.
Aileron area	29 sq ft
Stabilizer area	27 sq.ft. (expand)
Elevator area	14 7 sq ft.
Fin area	8 4 sq ft
Rudder area	7 9 sq ft.
Dihedral	8½ deg effective
Weight empty	2 580 lb.
Disposable load	1 900 lb.
Gross weight loaded	4 500 lb.
High speed	170 m p h.
Landing speed	55-60 m p.h
Service ceiling	19 300 ft.
Range at cruising speed	700 mi



Closeup of the Alpha showing some construction details

THE IRELAND "PRIVATEER"

ONE of the first airplanes having spot welded stainless steel ribs to receive the approval of the Department of Commerce is the "Privateer," P-2 manufactured by Ireland Aircraft, Inc., Garden City N Y While stainless steel is used extensively in Great Britain, fabricated by riveting, it required a rather complete modification of existing machines to employ spot welding effectively. Research in this direction is being carried on in several centers in the United States In this

particular case, however, the ribs are supplied by Fleetwings, Inc., an organization studying this problem and developing machinery for quantity production of ribs and other units

The Privateer is manufactured in several models varying only with respect to engine installation and landing gear equipment. The plane normally is available as an amphibion powered with the Warner Scarab engine rated 110 hp at 1850 r p m It has been furnished as a flying boat and with other power plants but all of these variations assume the same general form, i.e., that of an open monoplane of the pusher type with wing panels attached at the upper longerons and engine mounted in a nacelle supported on struts above the fuselage The machine is of the central hull type with tail surfaces supported on outriggers. It employs a side by side seating arrangement.

Wings are rectangular in plan form with an area of 198 sq ft of which 29 3 sq ft constitutes the ailerons The chord is 72 in., the dihedral 5 deg, incidence 4 deg. and sweepback 3½ deg Structurally the wings are composite having spruce beams and ribs of Alleghany metal fabricated by spot welding as previously mentioned. The compression struts are spruce and plywood and the covering is fabric Wing

Wasp powered Solar sesquiplane in flight.

Front quarter view of the Warner-powered Ireland Privateer

floats are of welded steel tube structure with nose reinforcement and fabric covering

Spruce and ash are used in the construction of the hull framework while the skin is Alclad and is bolted to the framework. The beam of the hull is 48 in. As in the case of the wings the tail surfaces are rectangular in form The area of the rudder is 11 sq ft while that of the fin is 10.75 sq ft. and the stabilizer 28 8 sq ft

One of the unusual features of the Privateer is its use of trimming struts in place of the customary flight adjustment of the stabilizer Adjustment on the ground is provided for the stabilizer but further changes are effected by means of two lift struts mounted between stabilizer trailing edge and the lower end of the rudder post. These struts may be rotated around their longitudinal axes and are so designed that an increase in angle produces negative lift, thus acting in the same manner as a negative stabilizer adjustment. They are controlled from the cockpit by a quadrant and cable arrangement acting against a shock cord

The retractable landing gear is provided with low-pressure tires, and employs no other shock absorbing medium The device is essentially a double crank, with connecting axle, loads being taken in bending and torsion on the crank, and in torsion on the axle Raising the landing gear is accomplished by means of a lever, and continuous cable acting on a bull-wheel keyed to the axle A single pull of the landing gear lever raises the wheels and locks them in a position partly within the contour of the wing Releasing a ratchet device, and allowing the lever to go forward causes the wheels to drop to the landing position, where they are arrested in their travel by a stop on the side of the hull structure. The position of this stop permits the crank arms to pass forward beyond the vertical position in their downward travel A steerable tail wheel is provided with a fairing which acts as a rudder in the water

Cockpit controls are conventional for side by side heating arrangement and a self-starter is provided as standard equipment for the engine. Brakes and dual controls are optional. The general specifications as furnished by the manufacturer for the Privateer P-2 are as follows.

Length	28 ft.
Height over all.	9 ft. 4 in.
Wing span	38 ft.
Beam of hull	48 in.
Weight empty	1,600 lb
Gross weight	1 850 lb
Gasoline capacity	30 gal

SOLAR SESQUIPLANE

DEPARTMENT of Commerce approval has recently been granted to the Solar all metal sesquiplane. This plane is an eight place cabin transport, powered with a Pratt & Whitney "Wasp" Senior engine, and is manufactured by the Solar Aircraft Co of San Diego, Calif

The wing construction is conventional, except for the elimination of drag bracing the drag load being carried by the corrugated metal covering The upper wing span is 56 ft 6 in with a chord of 8 ft 4 in, while the lower wing span is 18 ft., with a chord of 5 ft 10 in a 60 in gap being employed.

Wing spars are of the box beam type built entirely from duralumin, constructed by a method upon which the company has applied for patents The ribs are also constructed entirely of duralumin, the chord members being angles to which the wing covering is riveted and the web members round duralumin tubes arranged so as to form a Warren truss Wing covering is of corrugated duralumin the upper wing covering having a thickness of 0 013 in and the lower wing 0 020 in

Continuous corrugations around the leading edge of the wings and fully

corrugated wing tips are used. Corrugations are spaced 1.25 in. apart and have a radius of $\frac{3}{16}$ in., thus providing a flat portion of metal between each corrugation.

Ailerons are of the Frise type, providing positive aileron control under all conditions of flight, with an angular travel of 25 deg. up and 20 deg. down. Aileron hinges are mounted on self-aligning ball bearings. The aileron area is 41.6 sq.ft.

Forward inter-plane struts on each side of the fuselage are constructed from streamlined duralumin tubing 5.43 in. x 2.30 in. x 1.48 in., while the two rear struts are from similar tubing 4.72 in. x 2.00 in. x 0.095 in.

The fuselage is constructed entirely from duralumin tubes and channels, to which is attached the corrugated metal covering. The portion of the fuselage from the rear of the passengers' cabin forward is of complete truss construction so arranged that no fuselage members cross window openings. The fuselage to the rear of the passengers' cabin has definite longerons and vertical members but no diagonal bracing. The forward portion of the fuselage is covered with corrugated duralumin 0.013 in. thick and the covering for the rear portion is 0.020 in. in thickness. The fuselage floor girders are "I" beam in section made by riveting duralumin webs 0.032 in. in thickness to extruded duralumin "T." Riveted to these girders is the corrugated duralumin floor covering 0.020 in. in thickness.

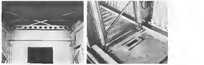
The pilots' cabin, placed forward of the leading edge of the upper wing. All windows are of shatterproof glass. The side windows may be raised or lowered by means of a crank.

Two gasoline tanks are located in the upper wing and have a total capacity of 110 gal., giving a cruising range of 560 mi. The oil tank, holds eight gallons.

The passengers' cabin is 47 in. wide, 8 ft. 9 in. long and has a height of 5 ft. 1 in. Windows are rectangular shape 15 in. x 20 in. also of shatterproof glass. Six chairs are provided.

Landing gear is made of chrome-molybdenum steel tubing and has a tread of 14 ft. Oleo pneumatic shock absorbers with a total deflection of 8 in. are provided, as well as Bendix wheels 36 in. x 8 in. with brakes controlled by toe pedals attached to the rudder controls. A tail wheel is provided equipped with a 12 in. x 4 in. pneumatic tire and a rubber disk shock absorber unit. This tail wheel, which is mounted on roller bearings, will castor 360 deg.

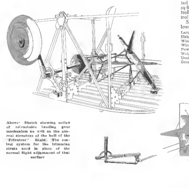
The empennage is made from duralumin channel frame work over which is riveted corrugated duralumin covering 0.013 in. thick. The stabilizer is triangular in plan form with an area of 52.1 sq.ft. It is braced with $\frac{1}{4}$-28 streamline wires running to the fin and a 2.047 in. x 0.854 in. x 0.049 in. streamline steel tube extending to the lower fuselage longeron. The stabilizer is adjustable in flight 4-$\frac{1}{2}$ deg. either side of neutral by a screw mechanism, actuated by a torque tube. The elevator, with an area of 30.2 sq.ft., has an angle of travel of 30 deg. up and 20 deg. down. The rudder with 15.2 sq.ft. and an angular travel of 25 deg. each side of neutral and the fin with an area of 8.8 sq.ft., which is adjustable on the ground, give a total of 24 sq.ft. of area in the vertical tail surfaces. Horizontal tail surfaces have a total area of 82.3 sq.ft. The rudder and elevator are controlled by flexible cables running to control horns.

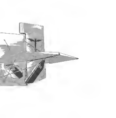


Left: Cabin structure interior of Solar plane, showing fuselage construction particularly at point where front spar loads are carried across. Right: Looking down on rear face of upper front wing spar, showing detail at compression rib attachment. The reinforced opening is for aileron cable

Specifications of the plane are as follows:

Length overall	36 ft.
Height overall	10 ft. 2 in.
Wing span	58 ft. 8 in.
Wing loading	11.4 lb. per sq.ft.
Power loading	13.4 lb. per sq.ft.
Weight empty	3,665 lb.
Useful load	1,985 lb.
Gross weight	5,650 lb.





Above: Sketch showing action of retractable landing gear mechanism as well as the general structure of the hull of the "Privateer." Right: The control system for the trimming struts used in place of the normal flight adjustment of that surface

The Salesman's Notebook

A SUGGESTION TO EMPLOYEES

By Walter L. Avery

General Manager, Valley Stream Airport

[Although this Curtiss-Wright, Valley Stream, L. I. organization letter does not properly come under the classification of Sales Tips we are publishing it because we consider it to be a frank and straight-from-the-shoulder appeal for demonstrations of courage at a time when courage is most needed. Ed.]

GENERAL business including aviation is, of course, very much less active this year than it was last year.

However, our Curtiss-Wright Airport here at Valley Stream is one of the few examples of airports with increasing activity, our local business for July and August last year being $123,036.33, and for July and August this year is $150,077.04.

We believe that today our airport here at Valley Stream is the largest and most active airport in the world, that is owned and operated by any one company—an organization of which you and I can well be proud.

But, think this over. No officer or employee of any company can personally guarantee the prosperity of the company. No one in this company or any other company can guarantee you a job. But you can actively help guarantee your own job, and that of every other one of the 128 employees on this airport by being a loyal and enthusiastic booster for Curtiss-Wright in general and this airport in particular, twenty-four hours per day. That is, do your job enthusiastically and carefully, in order to satisfy and retain the business that we now have. And tell the world about it, in order to bring in new business.

It is difficult to be enthusiastic when general business conditions are declining, because two out of three of the people that you talk to are spreading gloom. My personal suggestion for your benefit and my benefit, and our company's benefit is this—agree with the gloom spreader and pessimist *only* to this extent—that *if* general business could decline to the point where, of the 1,600 airports in the United States, only one airport continues to operate, our airport will be that one. And that in the meantime, Curtiss-Wright Airport, Valley Stream, is unquestionably one of the largest, finest and most active operating units in the aviation industry today, and that you are doing your stuff to help keep it that way.

Contributions to this department are solicited, and as an inducement to aeronautical merchandising men AVIATION will pay the sum of $20 for the best article, $10 for the second best, and $5 for every other article printed. Merchandising value, originality and brevity will constitute the judging yardstick. Contributions must be in this office by the fifth of the month for insertion in the following month's issue

SELLING AND SOCIAL CONTACTS

By W. A. Speer

Sales Manager Airtech, Inc., Fleet distributors, San Diego, Calif

MANY of my sales have been made to young sportsmen of about my own age. In handling such prospects I find the social approach best in most cases, rather than holding to a strict, "office hours" business attitude.

Membership in a social fraternity, a local rowing club, and the local athletic club have built up friendships among the type of men who can be sold airplanes for their own private use. I value these friendships and find that many good sales leads come from ordinary personal conversations on subjects not even remotely connected with aviation.

A good feature of the social approach, whenever it can be followed, is that it is much easier to size a prospect up and to determine how live a possibility and how good a risk he represents, if it is possible to spend an afternoon or evening with him. During the course of such visits I often find it possible to place the prospect in a buying frame of mind through showing him my scrap books of photographs which I have taken while on cross country trips, or of newspaper clippings which refer to my own flying experiences. These things are common enough in themselves but the fact that I personally fly a plane and can exhibit aerial photographs and newspaper clippings to prove it and to prove how much fun I have doing it, is often the deciding factor in making a sale.

Furthermore, since I have my own personal airplane, I can take prospects on flights which are friendly jaunts rather than formal demonstrations. Such demonstrations can easily and inexpensively take the form of a cross country trip or an overnight flight to some particular event which I planned to attend anyway. Such friendly associations, in the air or on the ground, sometimes put over sales for me where straight facts and figures and calculated "according-to-the book" sales efforts would fail.

DEMONSTRATION PROBLEMS

By Earl D. Prudden

Sales Manager, T. C. Ryan Aeronautical Co. and T. C. Ryan Flying School, San Diego, Calif

THE problem of giving a free "demonstration" flight to people who represent themselves as prospects for the purchase of an airplane has always seemed to be the bugbear of the aircraft salesman and used to bother us a lot.

It is very often difficult, if not impossible to tell from a polite conversation whether a man is really a prospect or whether he is merely attempting to "mooch" a free ride. If too many demonstrations are given the cost of selling mounts alarmingly. Yet, if demonstrations are refused to people who really are prospective purchasers, sales are likely to be lost.

About a year ago we hit upon the plan of requiring every prospect to take the private pilot's physical examination before being given a demonstration flight. Our chief argument with the prospect is that if he will take the examination and successfully pass it we will permit him to take the stick and fly the plane in the air. If our prospect merely wants a free plane ride he naturally will not pay $10 for the examination. If he is a genuine prospect he will be eager to learn whether or not he is physically qualified to handle the plane which he seriously contemplates purchasing.

Under this new plan we encourage demonstration flights wherever possible where before we often attempted to steer clear of demonstrations. We find now that where a prospect will take the examination, and then the flight demonstration, that he is all settled in short order and we can sometimes close the sale right on the spot.

Of course there must be exceptions to this rule, particularly in the case of local business men of known position whose friendship and cooperation we value. Sometimes we will seek to demonstrate to a man who has not requested the flight but whose position in the com-

munity will tend to influence others, and naturally we do not insist upon the physical examination in such cases. We do keep a log book of such business demonstrations, however, and consistently check back from time to time in order to capitalize as much as possible upon the good will so created.

CASHING IN ON PROSPECT TIPS

By Jim Webster

General Manager, Rogers Aircraft, Inc Stearman distributors for So Calif

YEARS of airplane selling have convinced us that few airplanes are sold by selecting likely men and then setting out to sell them on aviation in general and some airplane in particular Our belief is that there are literally thousands of men who are good prospects for an airplane because they are already airminded, and so we think that our big job is to ferret out these individuals who are already sold on aviation and then sell them our particular airplane

Since aircraft are purchased by such widely varying types and classes of people our likely prospects are not easily located We have learned to appreciate the value of unusual tips as to where an airplane might be sold These tips sometimes come from the most unusual sources and so we cultivate every individual we can, on or off the flying field whether or not he or she may appear to be an immediate prospect. We seek to get as many people as possible to come out and go through our hangars, looking over the planes with us and talking about the possibilities of selling airplanes Thus we often get genuinely valuable sales leads from people who themselves will probably never be able to own an airplane

Employees who visit us often refer to the fact that their boss is in the market for an airplane, or has been talking a lot about aviation and might be interested in the purchase of a plane In such cases we get the name and address of the employer referred to, and without incriminating the employee, we approach our man.

What Our Readers Say

Safe Flying

TO THE EDITOR

Your editorial in AVIATION for September, "Safety—It Can Be Done," hit the nail on the head.

"It's stunting that's stunting aviation today" And by "stunting" I don't mean acrobatics I mean maneuvers not necessary to safe and efficient flying

As you stated in your editorial, between eighty and ninety per cent of the accidents are due to the human factor, and I will add that of these, ninety per cent are preventable and unnecessary

In other words, it's right up to us pilots When you get it right down to the final analysis, if the pilot of today does not hold the future of aviation in his hands he comes nearer doing so than anyone else

Analyse the accidents and a large majority of them are the result of a stall An airplane is a relatively safe vehicle if it is kept moving through the air fast enough in the right position or I might even omit the words referring to position, for an airplane stalls because of loss of speed

But make this test Station yourself on any busy airport and watch the take-offs and turns for a landing You will be surprised, if you have not made careful observations along this line how many pilots pull their ships off the ground and often turn down wind at a low altitude, or make a steeply banked turn upon approach to the field, often with the nose above the horizon To be sure they are in a comparatively safe flying position so long as they have their motor thrust, but if the thrust disappeared instantly, as it seldom does but may do at any time, they would be just out of luck

A mariner is right on the job when his vessel is in shallow water, or near the shore In flying a ship is near the shore and in shallow water when near the ground, in which position it is in taking off or landing, and that's when the pilot must be on the job Every pilot knows this and yet every so often one is killed because he violates this fundamental rule of good piloting

If I were asked for only one rule for safe flying I would say, as hackneyed as it is, "keep your tail high on the turns"

EARLE OVINGTON
Santa Barbara, Calif

Clubs for Reserve Corps Members

TO THE EDITOR

I am a pilot and a subscriber to AVIATION Have noted with interest your section devoted to letters from readers Undoubtedly various manufacturers read it too May I offer a suggestion that might prove of value in dollars and cents to some of them?

There are various organizations of National Guard and Naval Reserve Air Services throughout the country The major portion of the personnel consists of the enlisted men These enlisted men receive some flying but not as much as they would like to

It seems to me that the manufacturer of some medium priced plane could sell some of his models to "clubs" organized by these enlisted men They have a real desire to fly They learn enough about airplanes to enable them to service and repair them by their own efforts.

If some manufacturer would have a pilot drop in on the various squadron airports and talk this matter over with the enlisted men through their social organization, I am certain he will find them in a receptive mood for the idea especially if some finance plan could be used for the purchase of the plane

It is most likely that the enlisted men could get some flight officer to give them instruction, and the fact that they could do all upkeep and repair work themselves would enable all members to fly at a very moderate figure

I do not believe that airplanes could be sold in any quantity through the use of this idea, although every pilot turned out would be a future prospect, but even so *every sale counts*

JOHN L SCHERER
New York, N Y

[Mr Scherer, who is a former non-commissioned officer in a National Guard squadron is presumably speaking from definite knowledge of the possibilities that would have existed at least in his own unit It is an interesting suggestion that he makes Has anyone had any experience along this line?—Ed]

Personnel and the Industry

TO THE EDITOR

The aircraft fraternity will certainly subscribe with enthusiasm to your call for markets as outlined in the editorial "Embarrassment of Riches" in the August number of AVIATION Although the industry is suffering from small demand for its products it is hard for me to believe that it is also suffering from excess personnel Far from being discouraging, it seems to me that the enrollment of greater and greater numbers is sure to benefit aviation in the long run.

It is clear that the market for airplanes is at any one time absolutely limited by the number of persons who can operate them and keep them in running order Putting it a little differently, if the Wright Brothers had at their first attempt built a "Spirit of St Louis" or a Ford Trimotor there would have been no market for it, as no one would have been available to fly it

An excess of pilots and others practically trained in the industry who are

looking to it for their economic welfare, constitute in themselves a stimulating and educating group whose activities should greatly accelerate the practical exploitation of aviation on a large scale I know of no better salesmen for the industry than those whose livelihood is directly affected by the industry's prosperity

This point of view does not imply favoring the training of numberless persons who would stand no chance of profitable employment The relationship between supply and demand of personnel is a very unstable thing, which can quickly change and as I have suggested, may in the case of a new industry like aviation, change through the very momentum created by the surplus I happen to know two or three men in this city, well trained in the different phases of the aviation industry who are today starting a new aviation enterprise because of the simple fact that they need to do it to make a living There are no limits to this as there are none to the expansion of the industry, if a sufficient number of practically trained people are available to do the job

MARTIN DODGE
Vice Pres
Aviation Securities Corp
of New England
Boston, Mass

[The editorial to which Mr Dodge refers was not intended to imply that aviation can spare any good men or that recruits to the ranks of the aeronautical industry should be scorned There is a great deal of force in the point that he makes There is real danger, however of laying too much stress on kinds of activities that will interest the participants only in working in the aviation industry and not at all in becoming customers for its products —Ed]

Airplane Salesmen

TO THE EDITOR

The writer has followed with considerable interest the various articles in not only AVIATION but several other magazines along the lines of selling airplanes I should greatly appreciate it if you could find it possible to find space for these few remarks as I feel that they represent not only my personal conclusions but also those of a number of others in similar circumstances

Not more than a few weeks ago I read one of the latest articles on the above subject entitled "The Aviation Industry Needs more Salesmen and more Salesmanship" From my personal experience I find that by far the majority of airplane concerns employing salesmen have tried to manufacture salesmen by the following methods First utilizing men who were possibly pilots during the war period and who subsequently became associated with the automotive industry as salesmen after the war period This type of man is unquestionably the most effective at present. Second, employing pilots who thought they could sell and permitting this type of man to broadcast his opinions over the earth to the detriment of not only himself but the industry as well, this being accomplished by the grossly exaggerated claims that were made Third, filling in with students of aviation without proper training in either salesmanship or aviation. Of course in all of these instances some have made good but in most cases the majority have failed

Now let's go right down to the reason Other things being equal, class number one should produce the proper results and make progress. Class number two never should have tried selling, as they are still too imbued with the romantic side of aviation and cannot seem to realize that any business must be run on a dollars and cents basis Unquestionably a mistake has been made in expecting a man with no business training to suddenly acquire it overnight, along with the ability to sell and produce results Class number three has produced some men who in spite of the handicaps have done remarkably well This however, has not been the result of selling aviation or airplanes but has in all probability been due to the fact that Mr John Public came to them and asked for information regarding aviation and they were fortunate enough to be most convenient and did have a sufficient amount of common sense not to make too many exaggerated statements so Mr Prospect bought but was not necessarily sold

There is however a fourth type of man who unquestionably would be highly efficient if permitted to demonstrate what could be done. This man is a trained and finished salesman capable of talking to the biggest yet perfectly willing and versatile enough to talk to the smallest, presenting his problem in the light that Mr John Public would like to see it This type of man realizes that in order to promote and build up sales a groundwork must be laid This is usually a bit slow at first but with properly directed effort will produce results A long time ago someone advanced the theory that "You can not take anything out unless you put something in" This is just what the aviation industry has been trying to do for some time past In practically all cases airplane salesmen have been placed on a commission basis Early last year this was a gold mine for most so-called salesmen when there was a general rush to find out the whys and wherefores of aviation. Today the situation has changed and Mr Public no longer has the spontaneous ambition that he once had to learn about aviation From now on, aviation must be *Sold*

With the changed situation we are confronted with the following in terms of our classes of salesmen Class number one has found that the commission has been cut down to a point where they cannot even exist and as a result have or are considering retiring from the industry and returning to their previous line of endeavor Some will naturally remain and this type of man should receive the co-operation of his superiors to the fullest extent. Class number two is fast waning and a very few still remain, most of these have long since decided that piloting is a better game. If they have not decided by themselves their employers have decided the issue for them Class number three has gone or is going the ways of the wind Some are doggedly hanging on in hopes that the good times will return once again, some have given up altogether and have been swallowed up in other lines of endeavor and some are hanging around the airports and other places of congregation somewhat sad and disillusioned but still hoping The fourth type of man has not, except in rare instances had an opportunity to demonstrate his ability or his lack of it In all probability he has been biding his time content to work at his present occupation until the cycle of events present a more favorable time for him to market his services In the meantime he has been one of the consistent buyers of flying training, having in the back of his mind just such a time as we are now going through This man may not be the best pilot in the world nor may he take part in any of the races that are reported in large print on the first page. However he is a finished salesman and has acquired a thorough knowledge of the basic principles of aviation by diligent application during the past two years This man is now ready to offer his services to the industry but finds that it is impossible to connect on any kind of an equitable basis

One firm advertises for a salesman to sell airplanes Let's call our man Mr A Mr A answers the ad only to find out that they wish to pay him for his services on a commission basis and this at a time when the groundwork and promotional activity must be expanded as never before.

Another firm advertises for a district manager to handle a territory and Mr. A again answers the ad This time the firm is a little more liberal They offer him a salary, expenses and a commission on sales in the territory covered by him. But the catch has not been sprung They offer the position if he purchases one of their planes as a demonstrator. Now Mr A has in all probability spent his savings over the past few years for his training in flying and acquiring a knowledge of aviation and he does not have the funds available to purchase the demonstrator If he did have why should it be necessary for him to provide his demonstrator? When an automotive firm desire a salesman to demonstrate and sell automobiles do they say we will give you a position if you buy a car from us? I know very few who do and these few do not keep their salesmen very long

The aviation industry has got to realize that it costs money to sell airplanes and this cost is just as much a part of the ultimate cost as is the manufacturing of the product itself The selling force must be built up of men

who have proved their salesmanship If the firm by its lack of co-operation or its method of compensation introduces other major problems into the sphere the salesman's efficiency is impaired. All salesmen must live and their families must live In order to do this they must have some sort of compensation that will permit this to be done so as not to permit it to interfere with their selling effort. There are many times when some outside co-operation is needed to close a deal This co-operation must be extended or the efficiency is again impaired In other words the aviation industry as to selling must stop trying to *take something out without putting something in*

VINCENT B MOORE
Westwood, N. J.

A Pilot's Wife Speaks

TO THE EDITOR:

No doubt this letter will be quite uncommon, coming from the wife of a pilot. However, I want to express my view on AVIATION and some of the "write-ups" First a word about the magazine It should be in the hands of every man or woman who wants to fly, even though they are far from the beginning of flying Why? Because it gives them the fundamentals and understanding of what a plane is and how and why it flies In other words, a strong foundation will hold up a weak top Each and every article is a lesson well worth learning

The write up "As One Pilot to Another" in the September issue by Merrill C. Meigs is one of the best It is just common sense that should be put into practice by all flyers He expressed our view point to a T To me, flying is not a sport It is the greatest asset that civilization has It is far above the sport class In all classes of sport there is danger of fate Then why class flying with sport? For pastime and pleasure? Yes The same as a ride in a car or motor boat What Pilot Meigs says about age is very true Youth takes chances where an older pilot does not. Chances do not go hand in hand with flying In closing, just a word to the "Johnnie-wise pilot" It is better to be safe than to pull the curtain Yours for safe and sane flying.

ORPHA L BERTRAM

Abstracts and Reviews

BRITISH RACING DATA

"CORNERING" AT HIGH SPEEDS, *By W C. Jennings, British Aero Research Committee R. & M No. 1282*

PRIOR to the 1927 Schneider Trophy race, a theoretical investigation was made in an effort to determine the most efficient form of turn to be made when racing around a closed circuit. No attempt was made to obtain a general solution of the problem, but a set of constants was assumed, thus determining the performance of an imaginary airplane with which turns of different types were tried. (Actually the performance calculated by substituting the assumed constants in the level speed formula was that of the 1925 Curtiss racer, and the wing loading, power loading, etc also applied to that machine) This airplane was assumed to fly over a straight course consisting of two pylons, 12 miles apart. In all cases it was assumed that the commencement of the turn was so timed that the aircraft passed over but not beyond the turning point and the distance covered during the turn was allowed for when calculating the time required to complete the remainder of the course. Further, an acceleration of 5g was taken as the maximum permissible.

In the horizontal turn the machine was assumed to have constant acceleration. That is, on approaching the turning point, the aircraft was banked steeply and by means of the elevators and rudder was caused to circle the pylon in such a manner that the lift force, L, on the wings was equal to five times the weight of the airplane If the initial forward speed were sufficient the machine would be able to complete the turn without a loss of elevation before reaching the maximum incidence. If this condition were reached before the turn was completed it would be necessary to descend in order to maintain the speed corresponding to maximum incidence and the acceleration of 5g toward the center. In the latter case the angle of rotation is given by $\theta = \int \omega dt = \int \frac{w}{a} d V$, between the limits of top speed and minimum speed, w being the angular velocity, V the forward velocity, and a the forward acceleration. In the example the maximum incidence occurred at $\sqrt{5}$ times the minimum safe speed in normal flight, θ was 2.80 radians, and the remainder of the turn had to be completed at maximum incidence and losing height. The elevation lost amounted to only about 70 feet. Using the relationship between thrust and drag with the constants assumed for the machine, the speed time relationship was found to be expressed by the equation $\frac{d^2s}{dt^2} + P\frac{ds}{dt} = Q$, where $\frac{ds}{dt}$ = forward velocity, and P and Q are constants From this the time required to cover the course was computed to be 361 2 seconds including 0 6 seconds required to climb to 70 feet This time corresponded to a mean speed of 239 miles per hour as compared with a maximum level speed of 246 m p h.

It would be possible to complete the turn without loss of height by continuing the turn at maximum incidence and allowing the forward speed and acceleration toward the center to drop This was calculated and no appreciable difference was found in the time taken to cover the course.

If the maximum permissible acceleration were reduced the speed at the end of the turn, and hence, the mean speed, would increase but the path described during the turn would be considerably longer and the net result would be an increase in the time required for turning But since the speed at the end of the turn would be greater, the straight portion of the course would be completed in a faster time by the aircraft making the slower turn Results of calculations with the maximum load on the wings limited to 5W, 4½W, 4W, and 3W respectively (W being the weight of the airplane), were plotted, mean speed against load on the wings, and the curve indicated a maximum speed at a load of 4½W

These calculations were all based on the assumption that the aircraft always turned at constant acceleration toward the center It thus appears that no advantage is to be gained by making the turn at a very high acceleration but that a tight turn is definitely more efficient than a loose open turn

A curve was also drawn showing the angle of rotation that the machine would make before reaching maximum incidence when turning without loss of height at various values of L. From this it could be judged that for turns with constant acceleration the maximum mean speed over the course occurred when the turn was made without gain or loss of height and at such an acceleration that the speed at the end of the turn corresponded to the speed at maximum incidence. Actually, however, a small gain of elevation is usually advisable for practical reasons, such as to keep the pylon in view

Another method of turning for which calculations were made was to keep the plane at constant maximum incidence throughout the turn allowing the loads to vary. The time taken to make the turn was less than for any other method but due to the greatly decreased forward speed at the end of the turn, the time for the whole course was greater and a mean speed of 238.5 m.p.h. was obtained.

An investigation was made into the possibility of making the turn by doing a half loop, rolling out on top and utilizing the elevation gained to increase the speed on the straight part of the course The maximum loads on the wings were

held to 5W in the loop, the height gained in the loop being 1,230 feet Three methods of utilizing this elevation were investigated diving sharply and continuing at ground level, losing height gradually, and a path intermediate to the first two The gradual descent resulted in a higher mean speed over the course, but all three methods were two or more miles per hour slower than the most efficient horizontal turn.

Actual flight tests using a small scout type airplane confirmed the conclusions that the tight turns are more efficient than the more open turns

The calculations indicated that for the course considered, the best possible mean speed was about 3 per cent below the maximum level speed of the airplane

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EXPERIMENTAL COMPARISON BETWEEN A SERIES OF TURNS OF DIFFERENT DIAMETER ON A GLOSTER IV SEAPLANE, *By J K Hardy British Aero Research Committee R & M. No. 1301*

DURING the practice period preceding the 1929 Schneider Trophy race the question of turning was raised among the British team and it was decided to supplement by actual measurement the theoretical work done two years before, the results of which were presented in R. & M No. 1281.

A recording accelerometer and airspeed indicator was installed in a Gloster IV seaplane, together with a timing clock to mark the records at half second intervals Records were taken of the normal acceleration and airspeed for a number of turns through 180 deg including in most cases the time required to return to top speed. The best form of turn could then be deduced from an analysis of these records The maneuvers were limited to a horizontal plane since any gain or loss of height would add to the complexity of the problem and calculations indicated that there was no gain in performing the more complicated turns

The acceleration and speed were measured at the half-second marks on the recording film. The radius of turn was then found by substituting these values in the equation $R = \frac{v^2}{g}\sqrt{n^2 - 1}$ where R is the radius of turn, V the forward speed, g the gravitational constant, and ng the accelerometer reading. The angular velocity, Ω, about the point for which the value of R is appropriate is $\Omega = V/R$ from which θ, the angle traversed in each half-second may be found. With these values the path of the turn could be reconstructed.

Knowing the maximum speed of the airplane, the length of the course, and the path of the turns, the time to cover the course and the mean speed could then be calculated Also, it was possible to compute the time lost in rounding the curve and in regaining top speed. The maximum acceleration recorded was 6.2g with a mean normal value of about 4½, and within this range it was found that the time lost steadily decreased as the diameter of turn was reduced This was in agreement with theoretical work. It was also found that the decrease from the maximum level speed flight was almost exactly that found by the calculations, that is, about 3 per cent.

[It is interesting to compare the conclusions reached in R & M's No 1281 and No. 1301 with those of Lieut "Jimmy" Doolittle in his article, "Air Racing Technique and Tactics," in AVIATION, August 24, 1929 Doolittle asserts that the turn should be made as sharply as possible without appreciable loss of speed, but any considerable loss of forward speed will greatly increase the total time for the course He also believed that the turn can be made faster and sharper by diving slightly while rounding the pylon, thus losing from 50 to 100 feet. Thus it can be seen that in general, Doolittle's experience agrees with that of the British, though he differs with them in the advisability of losing altitude —Ed]

TUNED-REED COURSE INDICATOR

A TUNED-REED COURSE INDICATOR FOR THE 4 AND 12 COURSE AIRCRAFT RADIO RANGE, *By F W. Dunmore, Bureau of Standards Research Paper No 160.*

BUREAU of Standards Research Paper No 154 describes a 12 course radio range for the guidance of aircraft Research Paper No 160 gives a description of a visual indicating device developed for use with the radio beacon

This instrument when properly installed in the airplane, serves three functions (1) It indicates to the pilot when he is one one of the 12 courses, (2) it indicates when off the course, and approximately how many degrees and whether to the right or left, and (3) indicates in case he becomes lost, which course he is nearest, how to turn to get to it, and which way he is flying on it, that is, whether he is flying toward or away from the radio range station

The indicator contains three reeds, made of elinvar, and tuned to frequencies of 86.7, 108.3, and 65 cycles, respectively, the three frequencies of modulation used at the radio range. The reeds are polarized by a set of permanent magnets, and each reed is driven by its own set of electromagnets, the windings of which are all connected in series in the proper polarity to operate the polarized reeds The terminals of the electromagnets are connected to the output of the radio-range receiving set

The reeds, each bearing a white tab are arranged in a horizontal row and one of the outside reeds carries a light extension arm with tab, so that the vibrations of any two reeds can be observed adjacent to each other. Two shutters are provided, one to expose only the proper two tabs for the course being flown, and a second to simplify the operation of the indicator in connection with its use when flying "to" or "from" the radio range A map of the range indicates the courses by various colors, and a color chart on the shutters assists in finding and maintaining the desired course The whole indicator is contained in a shock proof mounting of cylindrical shape, 3½ inches in diameter, 5 inches long, and weighing about 1½ pounds Mounted on an instrument board, it is quite in keeping in size and appearance with the numerous other instruments usually placed there.

One simple rule is all that the pilot must remember in operating the indicator, that is, "Longest reed shows side off course" His map indicates the various radio beacon courses by colors Selecting the proper color for the course to be flown, he sets the two shutters to show that color Then he rotates the reed box in its mounting to read "from" or "to" right side up, depending on whether he wishes to fly from or toward the radio range Having so set the instrument, the longest reed will indicate the side off course, and he maintains the proper direction by keeping the vibrations of the two reeds of equal amplitude

It is possible to hold the airplane on a given radio range course with an accuracy of ± 1° when using a reed indicator of the type described.

TESTS ON METAL PROPELLERS

FULL SCALE WIND TUNNEL TESTS ON SEVERAL METAL PROPELLERS HAVING DIFFERENT BLADE FORMS *By Fred E Weick, N.A.C.A Tech Report No 340*

DATA collected from a series of tests on five aluminum alloy propellers having different blade forms, together with a discussion of results, composes this report

The propellers were all made of solid, forged aluminum alloy, one being of the one-piece Reed-R type, while the remainder had detachable blades fitting into a split steel hub All had very nearly the same mean geometrical pitch so that the results were more or less directly comparable All the detachable blade propellers had not only the same average geometrical pitch, but the same distribution of pitch along the radius. The pitch increased from hub to tip, and near the hub it was reduced to a very low value. The pitch of the Reed R type propeller, however, was nearly uniform along the radius. The propellers with detachable blades were units of a progressive development, all having the same airfoil section and average geometrical pitch, the variable being the section thickness ratio and blade width The Reed R-type had an airfoil section based upon the Clark Y while the other propellers had sections based on the R.A.F-6

The tests were conducted in the Pro-

peller Research Tunnel of the N A C.A The propellers were mounted on a Wright J-5 engine cowled into an open cockpit fuselage. Three propellers were direct drive, while two were geared 2 1, but an indirect comparison between all five was permissable since one of the geared propellers was geometrically similar to one of the direct-drive propellers All were driven at speeds sufficiently low as to be below the effect of high tip speeds

The resultant horizontal force of the propeller body combination as measured on the thrust balance was considered as being composed of three horizontal components, such that $R = T - D - \Delta D$, where T is the thrust of the propeller while operating in front of the body, D is the drag of the airplane alone, and ΔD is the increase in drag of the airplane with propeller, due to the slipstream The effective thrust was then defined as $= T - \Delta D = R + D$, and the propulsive efficiency = effective thrust × velocity of advance/input power The engine torque and power were corrected to eliminate the torque on the cylinders due to the twist of the airstream

The results were given in the form of curves of the coefficients of thrust, power, and efficiency plotted against V/nD. For purposes of comparison, the propulsive efficiencies were plotted against the speed power co-efficients

The difference in efficiency between the various blade forms was found to be small Highest maximum efficiency was attained by the blade with the lowest thickness ratio The Reed R-type had a maximum efficiency, about 3% lower than that of the best of the other propellers under the same conditions The airfoil section of the former, when tested in a windtunnel, is fully as efficient as the R.A F-6 used in the other propellers so that the difference in efficiency was attributed to the constant pitch distribution of the Reed R as opposed to the decreased pitch at the hub of the detachable blade propellers

New Volumes for the Shelves

ALUMINUM ALLOY DESIGN DATA

STRUCTURAL ALUMINUM HANDBOOK; *Published by the Aluminum Company of America, Pittsburgh, Pa. 201 pages, $1 00*

A BOOK of useful information for the designer of aluminum alloy structures has just been published by the Aluminum Company of America In form and make-up, the volume is similar to the familiar handbooks which are a standard part of the equipment of structural steel designers, and it should prove to be of equal importance in its field

The material of the book is presented in two sections, the first dealing with the manufacture, properties ,and uses of structural aluminum alloys, and the second containing tabulated data covering the detailed section properties, conversion tables, and miscellaneous technical information of use in connection with structural design. The discussion in Part I covers very briefly the historical development and methods of manufacture of the alloys Tables of composition and mechanical properties are followed by certain notes on the design of aluminum alloy structures including tables of allowable design stresses for the different alloys in various heat treated conditions It is pointed out that the design of aluminum structures differs very little from common practice with steel or other metals Special reference is made to the behavior of alloy structures exposed to elevated temperatures The usual formulae for the design of beams and columns are included, and various phases of construction practice, such as forming (hot and cold), punching riveting, welding, machining, etc., are discussed very briefly, references being given, however, to the more detailed instructions for these operations contained in other publications of the company

Part II consists entirely of tabulated data covering the detailed properties of the sections available, including angles I-beams Channels, Car-channels, H-beams, tees and zees. Weights and properties of a wide range of rectangular sections are also included, and the basic formulae for the calculation of section properties are given Following the structural data are tables of miscellaneous technical infoemation covering allied materials, such as bars rivets bolts pipe corrugated sheets and shingles A selection of mathematical conversion tables, and an index constitute the balance of the section A number of ruled sheets for notes and diagrams are included in the back of the book for the convenience of the user

The handbook offers in condensed and convenient form the information which the designer needs for the calculation of any aluminum alloy structure within the range of sizes of available structural shapes The arrangement of the whole is logical, and the tables of detailed data are put up in such a way as to be readily located and easily read The information contained is based on long experience and expert investigation, and may be considered as accurate and up-to-date — S PAUL JOHNSTON, *aeronautical engineer*

AERONAUTICS FOR BOYS

AIRCRAFT BOOK FOR BOYS, *by D Verrill, Harper & Brothers, 312 pp*

MISS VERRILL knows a great deal about aircraft, both at first hand and otherwise, and she has put most of her facts into her book. Unhappily, she did not sort them, and has, accordingly, produced a work which gives the appearance of a great, spilling, bureau drawer of miscellaneous infoemation. This discovery is doubly disappointing, since her table of contents is both logical and complete

It would be quite improper to review a book avowedly for juveniles with the intransigence usually reserved for pretentiousness. It should first off be admitted, therefore, that Miss Verrill has poured her book into a good, big mould and, with chapters on early history, elementary aerodynamics, motor designs, lighter-than-air craft, the war, parachutes, gliding, trips to airports, descriptions of flights instruction, model-building, aviation as a career, famous recent flights and a few words of advice to sky struck girls, has shown that she knows where the aeronautical interests of young people lie

But it is improper also to excuse a juvenile work for being slipshod on the ground that This is Good Enough for the Little Dears The Little Dears themselves are the first to reject this philosophy as this reviewer, who once got 450 letters in a week over an error in elementary algebra, can testify to his sorrow And although Miss Verrill has to her great credit avoided the sin of head-patting and my little lad ing, she has been notably less careful of fact, structure, and spellings than a good workman should be

Miss Verrill needed an editor and a proofreader with neither one of which the Messrs Harper saw fit to supply her The editor could greatly have improved her book by the elimination of repetitions which impede here story's progress and give the impression that the chapters were written as separate units without much regard for the joinery which makes a book a discrete whole and not a collection of miscellany The profreader relying on a good encyclopaedia, could have saved her a great number of errors in her thumbnail history which had it been accurate, would have been quite satisfactory in its conciseness

Miss Verrill's simple diagrams and sketches are clear and interesting The physical appearance of the book would

have ben quite satisfactory had not the publishers printed its nine halftone plates on a spongy, unsized paper so that all are thrown, like Mr Shelley's emotions into the shadow of a starless night

All of which is noted in sorrow The theoretical plan of Miss Verrill's book is so good that it is all the more to be regretted that haste, or whatever cause it was, prevented the finished work from being more satisfying The revision of a later edition could still make it the book it should be—ERIC HODGINS

HISTORY OF THE PARACHUTE

PARACHUTES, *By Charles J V Murphy, G P Putnam's Sons, New York, 275 pages, $2.50*

THIS is an excellent history of the parachute down to modern (post-war) times and is an interesting record of the part played by certain interests in the development of the parachute in the last ten or eleven years Any claim to consideration as a complete history of the parachute in the latter period must be set aside because of the fact that it is concerned chiefly with the excellent work of James M Russell and his associates However, this does not lessen one's interest in the story or make less valuable that part of parachute history so well described

After describing some of the earliest parachute experiences in this country and in Europe, the author mentions the gradual evolution of the device through the country fair and stunt period to occasional use in the World War and the inauguration of a definite drive in this country for a chute which would be practicable for military use

The focal point becomes thereafter the work of the special Parachute Section at McCook Field under the direction of Maj E L Hoffman between 1919 and 1924 The painstaking research and experimentation of this group studded here and there by tragic incidents and culminating in the perfection of a dependable life-saver of the air is material for a fascinating recital

Russell resigned from the Army in 1924 and the book is concerned after that date with the progress of the Russell Parachute Company, its development of the "lobe" type pack and experiments with a number of other designs This appears to be an accurate account of the record of this important company

The book is well written and has the stamp of authority One is made to realize what a long period of travail was necessary to produce what seems like a comparatively simple apparatus now that it is an every-day article. We are reminded, too, of the high wall of unsympathetic opinion which it was necessary to scale in order to get the device into general use—CHARLES H GALE *Assistant Editor of* AVIATION

MUCH ADO ABOUT PARACHUTES

PARACHUTES FOR AIRMEN *By Charles Dixon Isaac Pitman and Sons, $2 50*

MR DIXON has done a good job in stating the whys and wherefores of parachutes, but reading it produced a curious effect The subjects of his discussions made one feel like crying out But that was settled five or ten years ago It was only after some thought that one recalled that after starting with a promising type of airplane parachute the British services seemed to stand still in this line of work and finally adopted the parachutes developed here So one can only infer that in spite of the demonstrated reliability of the present-day implements Mr Dixon has felt the pressure of that same opposition which we used to feel five to ten years ago

Not so many years ago a vastly irritated American officer was heard to remark that he didn't want any parachutes in his unit, and if they were sent he would throw them into stores and never issue them Only a few years later at a conference on parachutes another officer remarked that the parachute then in use was perfect and his organization was not interested in research looking toward improvement These are among the many memories of the difficult period during which parachutes were becoming accepted in the American military services that Mr Dixon's book recalls It appears to have been written in the spirit that filled many of us in those days With the question of "to use or not to use" settled one can smile at the arguments as to *which* to use which agitate today's advertisements

In addition to a good description of the "Irvin" Mr Dixon describes the "Russell" and the "Robur" parachutes The two former are simply the British versions of the American originals The "Robur" of Swedish origin, shows many resemblances to parachutes tested by the Army and Navy during the period in which the present "Service" parachute first took form.

The detailed instructions on packing and maintenance are about the same as the manuals issued by our services

In discussing the application of parachutes to civil aircraft a preference is expressed for the large parachute intended to bring down the whole machine instead of the individual parachute Before there were practical airplanes inventors were busy devising parachutes of this sort And for any occasion but fire in the air their use seems obvious However, research seems desirable to find types which will open quicker, so that they may be effective at lower altitudes The heavy oil engine would seem to promise the end of the fire danger

"Parachutes for Airman" reflects mental attitudes on the part of the writer and public which fortunately have been left behind on this side of the Atlantic Although interesting to one who went through the period of argument about parachutes in this country, it does not offer much of real use to an American reader—STARR TRUSCOTT, *Formerly in charge of Parachute Section, Bureau of Aeronautics, U S Navy*

NARRATION OF A WORLD FLIGHT

WINGS AROUND THE WORLD, *By F K Baron von Koenig Warthausen G P Putnam's Sons, New York, 185 pages, $1 75*

ON August 9, 1929, Baron von Koenig-Warthausen, a 22 year-old German flier, left Tempelhof Field, Berlin, in his 20 hp Klemm Daimler on a non-stop flight to Moscow to win the Hindenburg Cup, offered annually for the most noteworthy German sportsman aerial venture

He made the trip in about fourteen hours and was later awarded the prize, but decided to fly further—and kept flying further by easy legs until, November 23, he found himself back in Berlin being welcomed as a round-the-world flier His route had taken him through Russia to Persia India, Burma, Siam, up to China and across to Japan by boat over Japan to Yokohama where he shipped for San Francisco from the Pacific Coast to New York and across the Atlantic by ship His small plane and program of safe flying had prevented any thoughts of attempting flight over the long water stretches

"Wings Around the World" is his own story of the the trip written as he explains in a simple style—"having never written anything before"—with his only aim being to provide a source of inspiration to others in the sporting realm of aviation

From the aeronautical standpoint the tale is interesting because it contains glimpses of the state of aviation in the countries through which he passed—their airports, number of planes and interest shown in this new activity

Also of significance are the performance figures cited and the various flying conditions encountered

The Baron states that for the flight of approximately 20 000 mi filling 450 hr of flying time, less than a 1 000 gal of gasoline costing in the neighborhood of $300 was used, while about $70 was spent for oil "In comparison with this," says the flier, "I might also say that I spent $700 for taxicabs going to and from airports This is a good object lesson for city planners both in America and Europe"

. Save for a broken valve suffered when approaching Detroit no engine trouble

was experienced over the very extensive course

The book, however, is not one meriting praise for its literary qualities For this reader, at least, the simplicity of style he mentions, running to short sentences and a matter-of-fact way of recounting the story made it impossible to sense the glamour and gloriousness of such an experience But as noted before, this side of the picture was not the Baron's aim

For several reasons, the following extract seems worthy of quoting "Here (San Francisco) I had my first taste of American newspapermen and their methods After talking to them, I really began to feel that I had accomplished something for aviation and my country"—MITCHELL C HODGES

THE WINDS AND THE WEATHER

AERONAUTICAL METEOROLOGY, *By Willis Ray Gregg, The Ronald Press Company, 405 pp $4 50.*

SINCE the first edition of this book in 1925 Mr. Gregg has discovered more of the needs of aeronautical meteorology In this, the second edition, he has incorporated many more facts and much helpful material without sacrificing the usefulness of the book for one unskilled and untrained in the higher branches of physics and mathematics The first edition contained 136 pages as against the 455 of the present edition

Three new chapters have been added to the book The first of these is one on Airship Meteorology and goes into much detail regarding the effect of various weather conditions upon lighter-than-aircraft This chapter gives more than usual amount of information and should be of much help to students in that type of work The second new chapter is on Ice Formation Here the author allows himself the wide range of all forms of flying craft from heavier-than-air to free balloons and gives the various conditions under which this menace may happen Precautions to observe are given and methods of obtaining instrument warning are also outlined

The third of the new chapters is one on the Airway Weather Service, as now in use on most of the transport flying lines throughout the country In this chapter he gives a very complete outline of the operating set up for such a system and he discusses both the personnel and the mechanical equipment necessary The opinion is expressed that there will be a speeding up of the weather service in the future

The other chapters of the book cover the same material but in a much more complete fashion, as did the first edition The wind, fog, clouds, and general weather phenomena are all dealt with

Chapter ten is devoted exclusively to weather forecasting and should be one of the most popular chapters in the book In this chapter, he gives information, and methods which may be used by the laymen to obtain some idea of weather conditions at any point to which he desires to fly, using only fundamental observations

All in all, the book is very much improved over the first one There has been a great tendency to simplify it and at the same time to incorporate more information in its pages All of the knowledge and progress made in weather forecasting during the last few years is incorporated in this new book —HENRY O PATTISON JR

ELEMENTS FOR THE LAYMAN

WINGS THE A B C OF FLYING *By Lieutenant Colonel W Lockwood Marsh with a foreword by Sir Samuel Hoor, Vanguard Press, New York City 138 pp $75*

AS its title suggests, this book is written as an elementary explanation of aircraft for non technical people with an inquiring turn of mind. As such it should not be subject to severe technical criticism and yet at the same time, the technical background cannot be ignored

Divided logically enough in two parts, one pertaining to heavier than air craft and the other to lighter than air, the subject matter also is arranged in logical sequence. The merit of logic, however, is often entirely overshadowed by a surprising disregard of relative values. Subjects of considerable technical importance and complexity are often dismissed with a sentence, whereas a page or more of text may be devoted to matter having a little or no moment

The text relating to the airplane is developed in three chapters, headed "The Wings," "Stability and Control," and "Construction and Operation" In the first, an outline of the theory of airfoils is given The reasons behind the plan and sectional form normally used in present day aircraft are described Disregarding an undue emphasis on the contributions of British scientists, the explanations given are logical, simple and lucid

"Stability and Control" is necessarily slightly more complex Even though handicapped by lack of descriptive diagrams, the author has given simple, direct explanations The subject matter is developed with relation to the three dimensions in which the airplane moves

The Chapter "Construction and Operation" is very poorly arranged, and takes up a wide range of subjects, which, to an uninformed reader, would apparently have only remote relationship

As with the subject of the airplane, three chapters are devoted to the description of balloons and airships The first, "Lift" gives a very excellent, simple explanation of the lifting effect of various gases commonly used in balloons The variations in lift due to varying atmospheric pressure and temperature are clearly described

A chapter each is devoted to the explanation of the rigid and non-rigid types of dirigibles

All told, "Wings" gives the novice reader a good introduction into the technical background of modern aircraft and airships, even though the text can not be described as having great literary merit There have been many such elementary books published; this one should at least stimulate interest in others —SHEPARD DUDLEY

The Buyers' Log Book

FLAT BELT GRINDER

SMALL parts which may be ground on a flat surface are easily adapted to the new belt sander and grinder recently announced by the Porter-Cable Machine Company, Syracuse New York This sander is very small, being only forty inches high but is extremely ruggedly built

A feature is the tilting top arrangement which allows the sander to be used either horizontally or vertical All moving parts of the machine are fitted with Zerk lubrication The belt speeds are from 3,000 to 4,000 ft per min

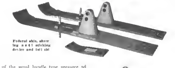
Standard equipment includes a 1 hp electric motor with switch and an 8 ft drop cord Also included are dust collecting bags, a blower and different belts and gages for the various types of grinding —AVIATION *December 1930*

WELD REGULATOR

THE Oxweld Type R 43 oxygen welding regulator, recently introduced by Oxweld Acetylene Company 30 E 42d St New York, by means of a system of two stage pressure reduction gives a constant line pressure free from any fluctuation The two stage reduction is accomplished through two separate and independent sets of diaphragms, dials, and springs Instead of the usual handle type pressure adjusting screw, found on all other Oxweld regulators, a rib cap screw has been substituted on this new instrument —AVIATION, *December, 1930*

Oxweld Type R-43 regulator

Porter-Cable flat belt sander and grinder



Federal skis, showing anti sticking device and tail ski

Model 700-p portable spray painting outfit

SPEED INDICATOR

THE Aircraft Instrument Division of the Elgin National Watch Co has just announced as an addition to its line a new Avigo instrument, the Air Speed Indicator The outstanding feature of this instrument is that it is fully jeweled having five sapphire and ruby jewels which according to the manufacturer not only reduce frictional error, but also reduce vibrational error because the parts are more accurately fitted The method of setting these jewels is identical to that used in the Elgin watch —AVIATION, *December, 1930*

FLYING BOOTS

BOOTS made of waterproof rubber goods and lined with lamb's wool have recently been placed on the market by the Goodrich Rubber Company of Akron Ohio These boots assure dry feet and warmth at high altitudes and were developed in conjunction with pilots flying the western mail routes These boots are made in three sizes —AVIATION, *December, 1930*

AIRPLANE SKIS

A COMPLETE line of ski equipment for airplanes of all weight classes is again being offered by the Federal Aircraft Works of Minneapolis, Minnesota Faced with duralumin sheet and runners and connected to the landing gear through duralumin columns these spruce skies have been in use for several seasons on many standard types.

Several attractive design features distinguish these skis from the ordinary run of such equipment The spruce members are tapered in thickness allowing a certain amount of flexibility which is desirable on rough surfaces The sizes for larger plane in addition incorporate two patent features One is the antisticking device In front of each column is a tube pivoted on a transverse axis when operated by the pilot this tube takes a vertical position and raises the front end of the ski from the snow thus preventing the freezing down or sticking of the ski in any type of weather conditions The plane is brought down off the peg by simply gunning the engine and letting the tube fold back into a horizontal position The other feature is a handling hole built through each column beneath the landing gear axle This permits a bar to be inserted and the ski to be raised by jacks so that a roller or other handling device can be put in place

The entire line of Federal skis has now been approved by the Department of Commerce —AVIATION, *December, 1930*

FUEL PUMP

A FUEL pump for aircraft has just been placed on the market by Romec Pump Co Elyria, Ohio This is the solid vane type, positive in action and the wearing parts are made of Nitralloy According to the company, the new pump will allow foreign matter to pass through instead of lodging between the teeth of the gears and springing the shaft. The weight is $2\frac{1}{4}$ lb.

This pump developed with by-pass and relief valve weighs $3\frac{1}{2}$ lb —AVIATION *December, 1930*

BRUNNER OUTFIT

MODEL 700 P, latest product of the Brunner Mfg Co, Utica, N Y, is a portable spray painting outfit for light duty suitable for touch-up work at the airport hangar It will handle the lacquer, varnish, enamel, special aircraft finishes and wing dope The outfit is larger than the average light duty outfit and is equipped with a standard Brunner Model 200 compressor displacing 2 cu.ft per min It is driven by a $\frac{1}{2}$ hp electric motor which can be operated off any light circuit —AVIATION, *December, 1930*

BRAKE GRINDER

THE Russell Manufacturing Co of Middletown, Conn, has just announced a new type of moulded brake-shoe liner grinder According to the company, this grinder quickly removes any high spots on the liners, restores the surface of glazed linings and produces the proper arc on the liner to conform to the drum contour It is claimed that the construction permits dressing the liners as perfectly on the ends as in the center and at the same time cleaning and burnishing the entire brakeshoe

The machine is equipped with heavy duty $\frac{1}{4}$ hp enclosed type, ball bearing motor, with double shaft. It has a 10 in steel plate with abrasive disc and at the rear an 8 in wire brush is secured The adjustable grinding table is graduated for shoe diameters and adjustable stops are provided Work is fed to the abrasive disc by means of a feed screw and contact is controlled by two flat stops placed in the center of the disc. —AVIATION, *December, 1930*

WELDING ELECTRODE

DEVELOPMENT of a general purpose steel-welding electrode known as the Flex-Arc is announced by the Westinghouse Electric & Manufacturing Co, East Pittsburgh, Pa. According to the manufacturer, the reduced

metal spattering effected by its use assures a stable, quiet arc at both high and low current values and a flexible tool is also provided for vertical and overhead welding

Tensile strengths ranging from 55,000 to 60,000 lb per sq in are said to be obtained without any special skill on the part of the operator The Flex-Arc electrodes are packed in standard 50 lb bundles and are carried in the following sizes: $\frac{1}{16}$ in, $\frac{3}{32}$ in, $\frac{1}{8}$ in, $\frac{5}{32}$ in, $\frac{3}{16}$ in and $\frac{1}{4}$ in.—AVIATION, *December, 1930*

AIRPORT HORN

THE latest development of the Macy Manufacturing Corp, Brooklyn, N Y, is a super power horn for airports, which will permit airport officials to issue orders to pilots and may be used for paging and warning patrons of the takeoff It may also be used to reproduce musical programs while passengers are waiting for their turn to take a ride

The new horn is equipped with six independent heavy duty receiving units Although the air column is the same length as that of a horn of similar size having a single unit, six times the pressure is applied, giving the instrument much greater projection power By means of a microphone arrangement descriptions of the various maneuvers through which a plane might go in actual flight can be explained to patrons by experienced flyers—AVIATION *December, 1930*

New Catalogs

▶ *Drilling High Manganese Steel* The new booklet of this title published by Whitman & Barnes, Inc., discusses requirements for successful drilling of high manganese steel and gives instructions for pointing drills

▶ *Pioneer Manual* A newly printed eight page manual is now available giving instructions for the operating and servicing of Pioneer instruments

▶ *Weston Instruments* The 1930 catalog of the Weston Electrical Instrument Co contains descriptions and prices of several instruments of interest to the aviation industry Magneto tachometers, pyrometers, etc, are listed Radio and testing instruments are also listed

▶ *G E Floodlighting Projectors* A recent G E publication illustrates many applications of Novalux floodlighting projectors for large area lighting The catalog contains descriptions and diagrams of the various types of projectors with recommendations as to their use. A general discussion of floodlighting problems occupies one section, in which are included tables of illuminating data for estimating purposes.

Side Slips

BY ROBERT R. OSBORN

SOME sort of a medal should be struck off for Captain Roy Ammel who, after his recent flight from New York to the Canal Zone gave out the following amazing interview, as reported in the *New York Times*

"When correspondents asked the object of the flight, Captain Ammel replied: 'It has no object, I just wanted to come to Panama, I used to live here you know'"

✦ IN a recent article on multi-engined ships the *Times* quotes two prominent designers as stating that 'Motors are either reliable or they are not reliable" We demand proof

✦ MISS H L., our startling Mexican correspondent, sends in a communication from Brownsville, Texas We are not surprised to learn that she is no longer in Mexico, as we knew the folks down there wouldn't tolerate her claims that Mexican aviators go around bending longerons with their heads and never experience any but tail winds Also recently, she sent in some claims that Mexican cockroaches are as large as Monocoupes and had excellent flying characteristics,—possibly that was the final straw, which caused her deportation

Her letter enclosed a clipping of an advertisement from the *Houston Chronicle*

'*Airplanes* For Sale — Spartan 3 phase airplane dual control bank and twin indicator, Challenger motor ship Has 120 hours and is in A1 shape N C license $3,500 will take same J B Mason Pure Oil Co, Fort Worth Texas"

✦ A FEW weeks ago, Miss H L had sent in another clipping, this one from the *Brownsville Herald* which with the clipping quoted above show there are some fearful and wonderful air planes down by the Rio Grande

"A circling airplane which sent airport attaches scurrying some out of the way and some to attempts to stop the machine, ended its cruise this morning with a crash into a hangar door which slightly injured two men **** The accident was said to have occurred when one of the visiting Mexican fliers got out of his plane on the landing field with the engine running In some way the gears shifted and the unmanned machine started moving It was said to have made several circles before it decided to enter the hangar"

✦ MR E P W has found the first clue which may account for the present depression in aeronautics and we think some sort of legal action should be taken against the manufacturer of the food which makes aviation no longer necessary. The quotation is from an advertising folder put out by the manufacturer A well-known British statesman who at the age of seventy years had taken to aviation as the only means by which his incorrigible insomnia could be overcome, after becoming acquainted with D—— found aviation no longer necessary and declared 'D—— is marvelous It puts me to sleep better than flying It is wonderfully better than anything else I know of"

✦ THIS MONTH'S ASTOUNDING AERONAUTICAL EVENT "Tests recently completed on the Curtiss Condor 18 passenger transport, are claimed to show that with one of the two engines cut off when the plane was not more than fifty feet off the ground the plane climbed steadily to 700 feet under full load with the use of the rudder"—Discovered in a contemporary aeronautical magazine by A L C of Curtiss Field, Glenview, Ill

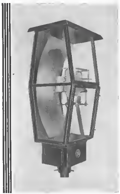
✦ FOR the good of all concerned in the future of aviation we hope there won't be many pilots interested in "distinction" as outlined in a clipping from a Chicago paper "The ship was flown by——— who won unusual distinction at the air races last year by flying a tri-motored Ford ship upside down and looping outside loops with it over the heads of the spectators"

✦ MR W K E of Baltimore, Md calls our attention to an item in THE AVIATION NEWS which indicates that the boys are still putting the parts of the busted airplanes together to make up whole ones—aeronautical mergers, as it were, retaining the best features of all

'Columbus—A total 1 241 planes arrived at Port Columbus during the first nine months of this year, 1 177 planes have taken off 5,046 passengers have arrived and 5,574 have departed."

✦ DESIGNERS have always attempted to imitate the birds in building their airplanes but we believe the matter has at last gone too far One designer has apparently turned out a ship which tucks its head under its wing, only at night in the hangar, we hope The clipping is from the *New York Times*: "The motor is cowled under a NACA low drag wing and the landing gear retracts, each of which features add greatly to the speed of the plane"—Found by Mr R A S of Paterson, N J.

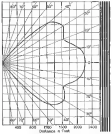
Lighting 2,800,000 square feet with 3 kilowatts
..a new G-E floodlight for airports



The new G-E 3-kw. floodlight, Type 1ALH5B

AGAIN, General Electric engineers have produced an airport floodlight that sets a new standard in efficient light distribution. Using two 1500-watt, 32-volt MAZDA lamps, this new floodlight is admirably suited for the illumination of small airports. At large airports, groups of two or more units, properly located, provide excellent flexibility to meet changing wind direction; pilots need never land facing directly into the light beam.

This floodlight can be connected directly to either 115- or 230-volt supply lines; an auto-transformer to supply the proper lamp voltage is built into the supporting case. Complete information is available at the G-E office nearest you, or address General Electric Company, Schenectady, N. Y.



THE diagram shows the light distribution obtained with this new G-E floodlight. The area within the heavy black line is lighted to an intensity of 0.15 foot-candle (vertical) as specified by Department of Commerce Regulations. A 36-inch cylindrical parabolic glass mirror makes possible this excellent distribution. Louvers and spherical mirrors in front of the lamps minimize waste light and glare.

721-57

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

To start easily and fly safely

USE PENNZOIL

"THE BEST MOTOR OIL IN THE WORLD"

IT'S not difficult to find an oil that allows your motor to start easily in cold weather. If that were the only requirement, you could use many inferior oils with impunity. But it's another matter to find an oil that will give you both easy starting *and safe lubrication.* Many so-called winter oils have been thinned out to the point where most of their lubricating value is lost. After a few hours' flying, they break down and expose your motor to the ravages of internal heat and friction.

Winter flying is "good" flying—do it with peace of mind. Fill up with Pennzoil—use it for thirty hours or more—then note its color and consistency when it is drained from the crankcase. See how rich and oily it remains after the hardest kind of punishment. It is visible proof that your motor has enjoyed perfect protection in every part, no matter what flight conditions you may have met.

PERMIT NO. 2—
PENNSYLVANIA GRADE
CRUDE OIL ASS'N

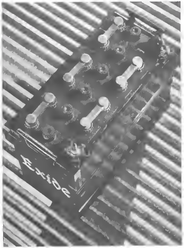
It is because of Pennzoil's reliability under all climatic and operating conditions that it has become known as the ideal lubricant for airplane motors. It is the chosen oil of America's great passenger lines and has been adopted by good operators everywhere. They have discovered that Pennzoil is not only the best aircraft oil, but the most economical, too. It lasts twice as long as ordinary oils—giving you approximately *fifteen extra hours of flying with every filling.*

Fly with Pennzoil, and fly from winter engine troubles! Sold by dealers from Maine to California.

THE PENNZOIL COMPANY
Executive Offices and Refinery: Oil City, Pa.
Division Offices: New York, Chicago, Los Angeles

PENNZOIL
HIGHEST QUALITY PENNSYLVANIA OIL

LIGHT-WEIGHT EXIDES . . . for any type of plane



Specially designed Exides are built for hard flying service

FOR safe avigation reliable batteries are vital. The Exide Aircraft Battery is built to meet rigid air requirements . . . fill the need for a light-weight, safe, efficient storage battery

Specially designed so *the electrolyte will not spill,* Exides have proved themselves *the* dependable battery for starting and ignition, cabin, instrument board and avigation lights, radio power and landing lights And millions of miles of successful flying service stand witness to the worth of Exide Aircraft Batteries

Write to-day for information on these famous batteries, the many types and their varied applications.

THIS LIGHT, COMPACT BATTERY *is specially built to conform with rigid air requirements*

BRILLIANT LANDING LIGHTS *can be depended upon when Exides are on the job*

Exide AIRCRAFT BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

Exide Batteries of Canada, Limited, Toronto

HAWKS

AND HIS FAST TRAVEL AIR LIVE UP TO THEIR NAMES!

"Distance is great. Time is valuable. Speed flying is the practical answer to the demand for transportation that does the errands of big business in split-second time and on time."

Thus the logic of Frank Hawks and of many an Aviation leader. But none has fitted fancy to the fact with such success as the famous pilot of the Wright-powered Travel Air "Texaco 13"!

In this ship Hawks showed 11,000,000 people of the Pacific Coast that a bare half-day separates them from the Atlantic's populations. He brought Boston within 53 minutes of Manhattan. The overnight train trip from Detroit to New York he cut to a brief 2¾ hours. In 20 minutes he flew from Philadelphia to New York at 270 m. p. h.! His Havana-New York time was less than 8¾ hours.

The "Texaco 13" is a Travel Air "Mystery Ship," a Curtiss-Wright plane built for sure, smooth speed. Its engine is a "Whirlwind 300." Pilot, plane, and power plant all give glorious proof that Curtiss-Wright equipment can cut costs by making each minute mean 4 miles!

CURTISS-WRIGHT

AIRPLANE COMPANY

TRAVEL AIRS ROBINS MOTHS

ST. LOUIS, MISSOURI

Confidence

Lee Gehlbach—three years a Lieutenant and crack pilot in the First Pursuit Group—Winner of the longest air race ever held—expresses utmost confidence in Continental Aircraft engines.

The Continental Aircraft 7 Cylinder Radial Engine 165 H P at 2000 R P M

Two of these Continental A-70 Aircraft Engines were entered in the 1930 Ford Reliability Tour. Both engines had perfect records for the entire tour—not a single part replacement—not a single adjustment was necessary.

Full Specifications on request

MR GEHLBACH says "The most impressive feature of this engine is its smoothness I have flown a good many engines, but I can safely say that there is less vibration in this than any radial engine I have ever flown It has plenty of power I have stood ships on their tails at 50° and the engine never faltered Another feature is its easy starting This engine kicks right over on almost the first turn For dependable, smooth performance it is in a class by itself" Lee Gehlbach

From airplane manufacturers—Verville, Waco, American Eagle, Rearwin—from prominent business men—from expert pilots—and from sportsmen owners, come enthusiastic endorsements of satisfaction and utmost confidence in the reliability and performance of the Continental Aircraft Engine. These owner and manufacturer endorsements are Continental's guarantee of reliability.

CONTINENTAL AIRCRAFT ENGINE CO.
General Office and Factory, Detroit Michigan

Confidence in *Continental* for the Airways of America

SWITLIK SAFETY CHUTES

The Perfect Parachute

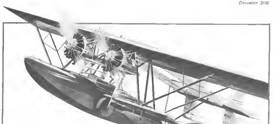
Proved Quicker Opening

Flyers have acclaimed the SWITLIK SAFETY CHUTE "The Perfect Parachute"—The small compact smooth pack, free from any flaps or elastic bands allow perfect freedom in climbing in and out of a cockpit. There is nothing to get caught and endanger the opening action of the chute. Soft linen adjustable harness is another feature all flyers like, as it is comfortable to wear. Air Mail Pilots, Department of Commerce Officials, and Foreign Government Officials are using SWITLIK CHUTES. Look over a SWITLIK SAFETY CHUTE—see it in action, then write us for our special Pilot Proposition.

The patented one-piece combination pack cover and pilot chute is one of the big reasons why SWITLIK SAFETY CHUTES have a surer and quicker opening. This cover is held to a flat tray by a single cable fastener, connected direct with the rip release. A pull of the rip and three instantaneous opening actions shoot out the pack cover which acts as a pilot chute. No chance of blanketing or snaking—clean snap action. In A.T.C. tests, SWITLIK CHUTE opening in 2.5 seconds as against the 3 seconds requirement. Write today for illustrated folder.

SWITLIK PARACHUTE & EQUIPMENT CO.

BROAD & DYE STREETS, TRENTON, NEW JERSEY



CAPTAIN BORIS SERGIEVSKY of the Sikorsky Aviation Corporation who tested the *new* Socony Motor Oil in his Sikorsky S-38.

the new

SOCONY MOTOR OIL

proved perfected in the air by Captain Sergievsky in his record-holding Sikorsky S-38

PERFECTED . . . proved in the laboratory, we already knew that the *new* Socony Motor Oil was a great oil for airplanes. But we further proved it in the air under actual flying conditions.

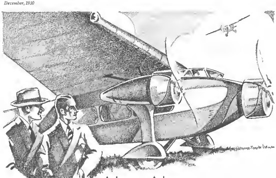
Captain Boris Sergievsky, holder of the world's altitude record for amphibians, shot his Socony-lubricated, record-breaking Sikorsky S-38 up for more than four and three-quarters miles . . . 25,200 feet on a sealed barograph . . . The *new* Socony Motor Oil lubricated the ship's two Pratt & Whitney Hornet engines perfectly throughout the flight.

Because it is completely dewaxed, the *new* Socony Motor Oil is more fluid at low temperatures than any other. It maintains the proper body at all engine temperatures, giving perfect piston seal, maximum power, and minimum fuel consumption. It is refined by the new and exclusive Socony process which gives additional lubricating value and insures less wear on your engine.

Try the *new* Socony Motor Oil today.

Perfected . . . proved . . . in every way!

STANDARD OIL COMPANY OF NEW YORK



Alcoa Aluminum in wings, fuselage, engine . . . Speeds Plane Sales

Planes that sell fast, are planes that promise low maintenance costs and high operating revenue.

The use of the light, strong Alloys of Alcoa Aluminum in wings, fuselage and engine of your planes will accomplish both.

These alloys have great strength—55,000 lbs. per sq. inch minimum guaranteed tensile strength, and 42,000 yield point. These alloys are durable, shatter and splinter-proof, and non-combustible. They will outlast the plane.

In addition, the lightness of Alcoa Aluminum reduces weight of planes by hundreds of pounds. This weight can be added to pay-load—making every trip more profitable.

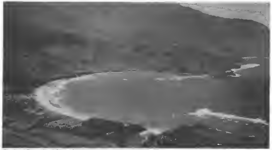
The use of the light, strong Alloys of Alcoa Aluminum has increased tremendously in the airplane industry in the past few years. More companies are using these alloys—more parts of planes are made of them.

Let the light, strong Alloys of Alcoa Aluminum help you both in production and selling. For complete information on the application of these alloys to aircraft, address ALUMINUM COMPANY of AMERICA; 2482 Oliver Bldg., PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

THE ONE METAL THAT FLIES BEST

LINKING THE HAWAIIAN ISLANDS BY AIR WITH *SIKORSKY AMPHIBIONS*



(Photo by 11th Photo Section, Air Corps, U. S. Army)

Passengers who ride in the comfortable Sikorsky Amphibions of the Inter-Island Airways get a new conception of the beauties of the Islands. The airview above shows Hanalei Bay, Kauai.

The five major islands of the Hawaiian group have been linked together for more than a year by commercial air transport. Daily round trip flights are made from Honolulu to Hilo. Maui, Molokai and Lanai are reached daily, and tri-weekly service is provided to the more remote Kauai. Three Sikorsky Amphibions are contributing speed and luxurious comfort to this service. With operation involving flight from and over both land and water, the quick convertibility of the Sikorsky is of primary importance. So, too, is the ability of

If you've flown over Inter-Island Airways you've probably met Chief Pilot C. I. Elliot and Mechanic Koski, shown above with their Sikorsky "S-38."

these sturdy ships to fly and maneuver on either of their two Wasp engines.

The "S-38" Amphibions used by Inter-Island Airways have a cruising speed under full load of 110 miles an hour. With a ceiling of more than 18,000 feet and a cruising range of over 600 miles, these amphibions satisfy Inter-Island's ideals of dependability, speed and comfort.

Sikorsky Amphibions are available in four models: the "S-39," carrying five persons; the 10-place "S-38"; the "S-41," which accommodates 16, and the "S-40" for 40 passengers. Detailed information concerning any or all of these models will be furnished promptly upon request. Please address Sikorsky Aviation Corporation, Bridgeport, Connecticut. Division of United Aircraft & Transport Corporation.

WORLD'S RECORD FOR SPEED WITH LOAD

SIKORSKY AMPHIBION

WORLD'S RECORD FOR ALTITUDE WITH LOAD

No more groping in the fog on these leading airlines which use Western Electric Aviation Communication Systems.

AMERICAN AIRWAYS INC
- Canadian Colonial Airways
- Colonial Air Transport
- Colonial Western Airways
- Embry Riddle Company
- Interstate Airlines
- Southern Air Transport
- Universal Aviation Corporation

NATIONAL PARKS AIRWAYS

UNITED AIRCRAFT AND TRANSPORT
- Boeing Air Transport
- National Air Transport
- Pacific Air Transport
- Varney Air Lines

WESTERN AIR EXPRESS

TRANSCONTINENTAL & WESTERN AIR

NORTHWEST AIRWAYS

Airplane Radio Telephone brings pilots in to the field *on time*

When fog blots out your pilot's view of the ground make sure that he will be able to follow the radio beacon signals to his destination. Equip your planes with the Western Electric radio receiver!

As he approaches his field, advise him by Western Electric radio telephone of height of ceiling, wind direction, ground conditions. With this constant aid from ground operators he comes in confidently for a safe landing.

At transport terminals where fogs are prevalent, dependable two-way communication between planes and ground must be carried on. Western Electric equipment assists in maintaining on-time service when flying would otherwise be out of the question.

The Western Electric airplane telephone has proved its worth in daily service on the leading airlines named above.

For full details, address Western Electric Company, Dept. 250A, 195 Broadway, New York, N. Y.

MADE BY THE MAKERS OF BELL TELEPHONES

Western Electric

Aviation Communication Systems

Your private "CORSAIR"

. . will bring you military performance —
and the absolute in a ship for BUSINESS or SPORT

FLYING your own Vought "Corsair" is like borrowing a Navy ship from a carrier or cruiser—all the thrill of real power, with the sort of construction that stands catapult launchings and deck landings.

Easily converted from land to seaplane, your "Corsair" is adaptable to the flying conditions you select. You'll find the "Corsair" operates easily from small fields or lakes. The same climb, speed and stamina that have built the "Corsair" reputation in the Navy and Marine Corps in foreign service, are essential qualifications for civilian use.

Powered with a Pratt & Whitney "Wasp" engine, the "Corsair" flies two people at a speed well over 145 miles per hour. As a seaplane the ship has a service ceiling of 19,500 feet. As a landplane, 21,000 feet. With a fuel capacity of 110 gallons the cruising range is 600 miles. For details of equipment, construction and particular fitness for sport and business flying, address CHANCE VOUGHT CORPORATION, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.

CHANCE VOUGHT

CORPORATION

The New Towle Amphibian— Powered by Twin Packard-Diesels

THE new Towle — first all-metal amphibian built in this country—is standard-equipped with twin Packard-Diesels.

In the Department of Commerce tests, which secured for the all-metal amphibian its Approved Type Certificate (No. 2-291) the new Towle made an excellent record. For take-off and climb it exceeded by large margins the minimum requirements. In addition it was able to maintain altitude and maneuver successfully *on only one engine.*

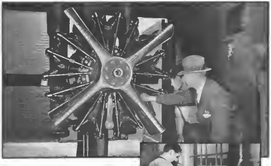
With full load, the new Towle Amphibian cruises at 100 m.p.h.—wide open at 124 m.p.h.—and the reserve power of the Twin Packard-Diesels is a constant factor of safety in flight.

The adoption by Towle adds still another aircraft manufacturer to the list offering Packard-Diesels as standard or optional equipment. More and more the advantages of the Packard-Diesel—elimination of fire hazard, absence of radio interference, marked economy and cleanliness of operation—are becoming recognized and desired by aircraft buyers.

PACKARD

ASK THE MAN WHO OWNS ONE

FINAL TEST AT FULL THROTTLE



ACTIVE life for each Pratt & Whitney engine starts immediately after its assembly. It is belt driven from an outside power source to give bearing surfaces some initial polish, and to check the operation of oil and fuel pumps, magnetos and valve gear. Next the engine goes to the test stand for an eight hour run-in under its own power.

Following the first period on the test stand each engine is completely torn down. All parts are washed and minutely inspected. After rebuilding, the engine returns to the test stand for a two hour second run-in and is then given its final test at full throttle. Into the permanent record of that engine are written readings of fuel and oil consumption, fuel pressure, oil pressure and temperature. Only after passing this final test and the critical inspection which follows is the engine adjudged worthy of the Pratt & Whitney seal.

No wonder "Wasp" and "Hornet" engines are favorites with pilots who rate dependability first. No wonder that on approximately ninety per cent of the major air transport lines of this country these engines are turning in consistently excellent logs — day and night.

THE
PRATT & WHITNEY AIRCRAFT CO.
EAST HARTFORD · · · CONNECTICUT
Division of United Aircraft & Transport Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec, in Continental Europe by Bavarian Motor Works, Munich, in Japan by Nakajima Aircraft Works, Tokyo

Wasp & Hornet *Engines*

"THAT FOR YOU ...old wet-blanket!"

"GO AHEAD, clouds. Be damp. Be cold. Blanket the skies with wintry juiciness, if you must. But don't think you'll ground *me!*" . . .

Yes, indeed—a pilot should worry about discomfort . . . as long as he's wearing a Spalding Wet-Weather Suit similar to the one shown at the right.

The outer shell of waterproof Bedford cloth will shed moisture like a ruffling duck. The inner layer of soft wool fleece will shut out the bitterest cold.

And you can just snuggle your neck and chin deep into the warm, electrified lamb fur collar—and shrug your shoulders at the biting blasts.

Like all Spalding Suits, the one-piece, slip-on suit illustrated at the right is designed to permit perfect freedom of movement. Protectively warm as it is—it is *not* bulky. And five hookless fasteners allow you to put it on or take it off, in short order.

Trim, good-looking, made for long hard wear, this fine suit is one of the most popular ever made by Spalding. Priced fairly, at $65.

Spalding has, of course, a complete stock of flying equipment, carried by all Spalding stores, and at most of the leading flying fields. See it there. Or send in the coupon and get a free catalog.

A. G. Spalding & Bros.
AVIATION EQUIPMENT

A. G. SPALDING & BROS
105 Nassau Street, New York City
Please send free Aviation Catalog
Name
Street
City State

© 1930 A. G. S. & B.

Your motor is worth protecting!

Aviation engine manufacturers agree that use of highest quality aviation oils means ultimate economy in longer engine life and increase of time between overhauls.

GULFPRIDE OILS are admitted to be America's Finest Aviation Oils. Many well known flyers insist on GULFPRIDE OILS for their motors. They notice the difference in increased performance, in lower overhaul cost and in increased safety.

GULFPRIDE OIL is especially refined for aircraft motors. It is manufactured in 5 viscosities as follows:—

GULFPRIDE OIL 75	for cold weather operation
GULFPRIDE OIL 100	
GULFPRIDE OIL 120	for warm weather operation
GULFPRIDE OIL 150	
GULFPRIDE OIL 200	for special high viscosity work

(Numbers indicate viscosity S U V at 210° F.)

GULFPRIDE OIL is marketed by one of the leaders in the oil industry—GULF—for aircraft owners who *care* most about their motors' performance.

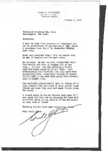
Gulfpride Oil

GULF REFINING CO.

F A I R C H I L D

AIRPLANES

Whether you are flying the largest transport or the smallest sport plane, your safety and satisfaction depend on quality.



An example of Fairchild pride of ownership: one of the many unsolicited letters from our files.

FAIRCHILD AIRPLANES are all built to standards of quality—never to a price. That is why they have built new frontiers beyond the Arctic Circle in Canada and Alaska and with Byrd in the Antarctic. They are regularly carrying the mail and passengers over the South American Andes in Mexico and throughout North America, in the service of transport operators, the U S Army and Navy, the Canadian and other foreign Governments. You, too, will find PRIDE OF OWNERSHIP in their quality and rugged dependability.

We offer the

FAIRCHILD "KR21"—a 2 place open biplane for training and sport.

FAIRCHILD "KR34"—a 3 place open biplane for sport and taxi.

FAIRCHILD "42"—a 4 place cabin monoplane for executive and private sportsman use.

FAIRCHILD "71"—a 7 place cabin monoplane for business, transport, express, etc

FAIRCHILD AIRPLANE MFG. CORP.

***Plants*—Farmingdale, L. I., N. Y.; Hagerstown, Md. Longueuil, P. Q., Canada**

Branches: G. B. Alexander Co. Metropolitan Airport, Van Nuys, Calif J. D. Curtis. Hangar No. 5 Love Field. Dallas, Texas

***Export Offices*—122 East 42nd Street, New York City**

DIVISION OF THE AVIATION CORPORATION

A FAIRCHILD "42"—cabin monoplane, similar to the plane Mr Johnston writes about

For More Effective Control

BENDIX Wheels and Brakes

FIVE years ago—unheard of! Today—standard equipment on practically all planes built: Bendix Wheels and Brakes; a vital safety feature, as every pilot knows; for a perfect "take-off;" for slowing the plane after landing; make any landing field "big enough."

BENDIX

BRAKE COMPANY

South Bend - Indiana

Sperry Beacon, using an insulating ring and terminal block of Bakelite Molded Sperry Gyroscope Co., Brooklyn, N Y

SPERRY ADOPTS BAKELITE MOLDED

FOR AIRWAY BEACON

Revolving at the rate of six times a minute, the Sperry beacon relies on the high insulation value of Bakelite Molded for unfailing performance. Mechanically strong and durable, this material also provides the non-deteriorating quality required for constant operation under adverse weather conditions.

In the rotating mechanism, the Bakelite Molded insulating ring is accurately formed with finished bolt holes, and no subsequent drilling, machining, or finishing is required. The terminal block is a one-piece Bakelite Molded part, in which the metal inserts, required for assembly, are firmly embedded in the molding operation

Non-hygroscopic and non-disintegrating, Bakelite Molded retains its high mechanical and dielectric strength in any climate or when subjected to the action of salt air. The lustrous finish, acquired in the mold, retains its attractiveness through long service. Write for Booklet 59M, "Bakelite Molded." Manufacturers are invited to enlist the cooperation of Bakelite Engineering Service

BAKELITE CORPORATION, 247 Park Avenue, New York. CHICAGO OFFICE, 635 West 22nd Street

BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

BAKELITE

THE MATERIAL OF A THOUSAND USES

18-passenger Curtiss Condor transport built for the T A T coast to coast air rail service powered with two Curtiss Conqueror Engines equipped with SRB Ball Bearings

AIRCRAFT engine service is truly the most exacting test of ball bearing performance. Economy of weight is of major importance. Bearing sizes must be held to an absolute minimum, consistent with safety. These are the reasons why aviation engineers specify SRB—the ball bearing that, size for size, gives the utmost in load-carrying capacity and durability.

Surely, a bearing that predominates over all others in aviation engines merits by this record a place in your own product.

STANDARD STEEL AND BEARINGS INCORPORATED
Plainville — DIVISION OF MARLIN ROCKWELL CORPORATION — Connecticut

PACIFIC COAST DISTRIBUTORS
F. M. Cobbledick Co., San Francisco, Cal.
E. D. Maltby Co., Los Angeles, Cal.
Northwest Bearings Co., Seattle, Wash.

Ball SRB Bearings

NOW! you may build or buy your first amphibian GLIDER!

Powered with a 25 H.P. "JACOBS" Motor. Adds only 60 lbs. weight.

Fuselage structure assembled with wing

Power, if you want it. A flexible plan to suit your need

No longer need you *wish* for an Amphibian Glider—a ship that you can fly as a training or soaring glider, or as an airplane, off, on and over land and water. *Now* your hopes may be realized—readily and at minimum expense.

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SPECIFICATIONS

Wing Span	36 ft.	Length Overall	25 ft.
Chord	71 ½ in.	Height Overall	3 ft. 10 in.
Wing Area	216 sq. ft.		

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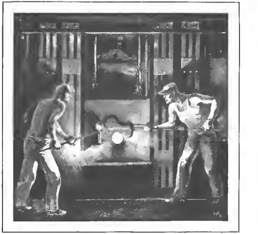

THE development of the Autogiro from a sensational experiment to a proven and practical flying craft has been characterized by shrewd engineering and continual search for better and higher performance equipment.

It is significant that from the time the first American Autogiro was merely a blue-print, Aerol Struts have always been in its specifications.

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Its ease of operation, its unfailing response and the convenience of a sure, quick start from the pilot's seat are of inestimable value to anyone owning a plane, and ***manufacturers*** are more and more realizing that ***prospective purchasers*** demand the ultimate in equipment on a plane as they do in their motor car.

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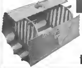


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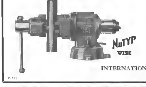
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Address all inquiries to our Sales Representative: Aircraft Radio Corporation, Boonton, N. J.

Model D Stromberg-Carlson Aircraft Receiver equipped with Eveready Raytheon 4-Pillar Tubes and powered by Eveready Dry Batteries. Over-all Dimensions of Receiver and Mounting Base: 16⅜ x 9¾ x 8¾ inches. Weight: 18 pounds. Licensed Under A. T. & T. Co., R. C. A., R. F. L. and Aircraft Radio Corp. Patents.

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COMMAND AIRE, new special built Warner sport job. Used forty hours. Solid air wheel undercarriage. Special paint job. Steel propeller. Excellent for training. Cost $5,250. Will take $3,000. Austin Burbank, 2014 Cherokee Parkway, Louisville, Ky

CURTISS Sea-Gull for sale in perfect condition. Price $2,200 ready to fly away. Wm Link, 249 13th Ave., Long Island City, N Y

FOR SALE: Brand new Alco Jr. sport monoplane, less motor, $625. A M Fox, U S Coast Guard, Galveston, Texas

FOR SALE: A well known three place open biplane, powered with Wright 300. Never damaged. Complete equipment. Price $2,500. FS-34 Aviation, Tenth Ave at 36th St., New York

FOR sale, Great Lakes licensed American Cirrus engine, 130 hours, never damaged, many extras, equal to new, $2,000. C Coffrin, 1325 67th St, Brooklyn, N Y

FOR SALE: Cessna Monoplane J 67, 120 hours. Will sacrifice for cash. FS-37 Aviation, 520 No Michigan Ave, Chicago, Ill

FOR sale, new Kinner B5 motor complete in original factory shipping case. Used eleven hours in experimental job. Can be sold for brand new motor. Price Six Hundred Seventy Five dollars. Will ship subject to examination on twenty per cent deposit. Five OX-5 cylinders, seats and guides good. Price Five Dollars each. Model A Hisso propeller, never damaged, Hartzell. Price Thirty dollars. E. F Dutro, Zanesville, Ohio

FOR sale or trade. New silk Russell Lobe seat pack type chute. Will consider car in trade. Jack Reeves, c/o Jack Segal, 2735 Ave. R, Brooklyn, N Y

FOR sale, new Millerized OX-5 Curtiss Robin Cabin, licensed, with compass and air speed indicator. First $1,800 takes it. Charles G Dockhorn, Goodland, Kansas

FOR SALE: Travel Air wings and parts. Also one OX motor $150, 180 hours. Recent overhaul. Good condition. Smith Reynolds Flying Service Inc., Congressional Airport, Rockville, Md

FOR SALE: Russell Sport monoplane, powered with 6 cyl Anzani, one place, must sell at once. Must be called for. First offer of $250 takes it. E G Locke, 501 Francis St, St Joseph, Mo

FOR SALE: OX-5 Combination Eaglerock unlicensed $550. OX 5 Waco 10 $850. Licensed, both in good flying condition. Arthur Fendler, 5831 Easton Ave, St Louis, Mo

FOR sale, French built four place Viking flying boat, 180 French Hispano motor, latest model. Complete set of instruments, air starter and built in fire extinguisher. Plane and motor in perfect condition. 100 hours. Sales price $7,500. L. M. Fales, P O Box 4802, Miami, Florida

(Continued on opposite page)

SEARCHLIGHT SECTION

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FOR SALE

(Continued from opposite page)

FOR SALE: Wright J 5 Motor complete with Hamilton Steel propeller and Eclipse Direct hand starter. Like new. Used very little before complete overhaul by Wright Service and never used since. $1850. Will sell separate. Service Aircraft Corp., 59th & Wyandotte, Kansas City, Mo

FOR sale, Arrow Sport LeBlonde motor, has just been relicensed in first class condition, priced very reasonably if taken at once. N & M Garage, Columbus, Neb

FOR sale or trade. Edo Pontoons complete, will fit Travelair, Waco, etc. A 1 condition $550. Kinner Model K complete, just overhauled, $350. Curtiss Challenger, some parts missing, $200. Martin Commercial with 200 hp engine, ready to fly, reasonable. P O Box 1524, Tampa, Fla

FOR SALE: Hisso 150 hp motor with propeller in fair condition. In running order, complete except wiring. $125 takes it. Malcolm Taylor, 707 Washington St, Alpena, Michigan

FOR SALE: J-5 Motor and steel propeller, excellent condition, $1200. A C Fletcher, Deer Creek, Oklahoma.

FOR SALE: Kirkham action OX travelaire, Scintilla magneto, 40 hours on motor. Excellent condition. Fuel. Any demonstration. $1450. Harold Brannick, Dobbs Ferry, N Y, Tel 2314

HANGAR: T-beam single ship for sale. Opening 66 feet by 18 feet, tail part 20 feet long, 8 feet high. Made by Truscon. Only 18 months old, in perfect condition, has had 2 coats of paint. Cost $850. The first $400 takes it. Wire E J Henke, 2810 Diversey Ave, Chicago, Illinois

HEATH Super Parasol Welded fuselage, empennage, engine mount, landing gear, wings, controls, cabins and instruments. New. $175. Stewart, 2681 N Rockwell St., Chicago, Ill

INTERNATIONAL parts, almost sufficient to set up complete ship, F 17, all for $200. Also International wings, spare ribs, etc. C R Mohlberger, Massillon, Ohio

IRWIN Meteormotor 4-cyl 25-35 hp with special aeromarine metal tipped propeller. Ideal for power glider. $380 or will exchange for new Heath B-4. E P Gordon, 31 Concord Ave, Cambridge, Mass

JENNY motor and ship in good condition, flying every day. $350. Delivered anywhere in South for expenses. New OX 5 Paragon Props $8 each. Paul Simonson, Arcadia, Fla.

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OX-5 Challenger OX, just overhauled, new Scintilla magneto, booster, air speed, compass, baggage compartment. Licensed and in good condition. Real buy for $985. Will accept car in trade. Westchester Airport Corp, Armonk, N Y

Additional For Sale and Wanted Ads on pages 68 and 69

FOR SALE

PARACHUTES, approved types, seat, back, chest and trainers, bought, sold, exchanged, repaired. Professional jumpers and balloonists furnished everywhere. Est 1883. Thompson Bros. Balloon & Parachute Co., Aurora, Ill

PROPELLER, Hamilton Standard, J-6-7, like new, guaranteed track and balance, 8'2" set 15° @ 42", sacrificed @ $150. Stearman wings, lowers, right and left, $100 each, tail group, skeg, all A 1 condition, slightly used J 5 cylinders complete $49.50. Bird upper right wing, new, half cover off, $90. Air Transport Equipment Inc., Garden City, N Y

SUPER Standard OX5 for sale. Good flying condition. Best offer takes it. Write to B Grafe, 1616 Martin Ave., Sheboygan, Wis

TWO overhauled OX 5 motors, good oil pressure, turning, $180 each. Two nearly new Liberty 12s, $75 each. Write for bargain prices on aircraft supplies. J L Schroeder Company, 6523 Harrisburg Blvd, Houston, Texas

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WRIGHT J-4 cylinders used and factory reconditioned, all sizes, 50% off list price. Satisfaction guaranteed or money refunded. Steel Air Services Inc., Cleveland Airport, Cleveland, Ohio

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WILL trade Waco 10 for T P Trainer. Will trade OX 5 Robin or Challenger Robin or Johnson. Burlington Flying Service, Burlington, Iowa.

EQUIPMENT WANTED

WANTED: Jenny with OX 5 motor. EW 38 Aviation, Tenth Ave. at 36th St, New York

WANTED: Monocoupe or some small cabin monoplane. Must be licensed and priced right. Send photo and details. F W Bilanis, 1160 Erie Street, Elgin, Ill

WANTED: Waco 'F' Challenger Robin or similar plane. OX 5 Robin for sale $1200, perfect shape. Ed Veras, 125 E Lincoln Ave, Goshen, Indiana

WANTED: Price for motor cowling or ring and parts for wheels for J 5 Waco Taperwing. Otto Wolf & Son, 486 Broad St., Bloomfield, N J. Phone Blfd 2-0206

WANTED: Used Fleet or American built Moth. State lowest price, condition and location in first letter. W 26 Aviation, Tenth Ave and 36th St., New York

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TRANSPORT pilot, experienced cross country passenger and instruction work. 600 hours open and cabin ships. Excel references, age twenty five. PW-29 Aviation, Tenth Ave at 36th St, New York

TRANSPORT PILOT. Available Dec 1. With or without ship. A 1 rating. 600 hours. Cross-country, high altitude, student instruction, sales experience. A and E mechanics license. Be interested in operating Municipal Airport. References. PW-28 Aviation, 520 No Michigan Ave., Chicago, Ill

TRANSPORT pilot, Spanish American, single, age 25. Parks Air College graduate, holding class 1 A and 2-C ratings. Desires position as salesman or pilot with firm or individual. PW 33 Aviation, Tenth Ave at 36th Street, New York.

POSITIONS VACANT

WANTED: Transport pilot, licensed aeroplane and engine mechanic and L C pilot. State experience and salary desired. P-31 Aviation, 520 No Michigan Ave, Chicago, Ill

WANTED: manager for export sales by large aircraft manufacturer. Must be experienced and understand several languages. Give complete record first letter. P 37 Aviation, 520 No Michigan Ave, Chicago, Ill

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Lambert R-266 Engine
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Type	Engine	Hours	Color	Price
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NB-3	NEW Velie	45	Blue & yel.	2 250
NB-3	LeBlond		Factory rebuilt	1 550
NB-3	LeBlond	125	Gr & yel.	1 850
NB-3	LeBlond	90	Gr & yel.	1 700
NB-3	LeBlond	155	Bl'k & yel	1 [illegible]
NB-3	LeBlond	121	Bl'k & yel.	1 250
Waco	OX-5		Blue & silv	1 200
Lincoln Eloco Standard	E		Bl k & or'g	800
Curtiss Standard XX		New	Silver	600
2 Clip Wing Standards	OX-5		Silver	450
Aeronca	Aeronca	New	Blue	1 900
Aeronca	Aeronca	75	Blue	[illegible]
NB Pwr Glider	Aeronca	20	Blue & yel.	150
*Flyer	Lee	16	Blue & silv	240

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Practically Brand New
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Wichita Kansas

J-5 Wright Whirlwind Motor

223 hp. 55 hours just inspected and overhauled by factory and yet out of crate—$2000

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1526 17th Street Washington D C

FOR SALE—MOTOR

English Gypsy Has had 237 hrs. and is completely overhauled

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OF SATISFACTION
FROM SEARCHLIGHT
ADVERTISERS

"We are pleased to inform you that we have sold the Lincoln Page which previously had been advertised in the Searchlight Section of Aviation.

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AV 261

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SWALLOW announces 50 more brand new improved two place sport and training ships now being built with round turtle back and fuselage, full type Army regulation parachute seats, safety stick, adjustable stabilizer from either cockpit and in beautiful two-tone colors.

At Prices Never Known in Airplane History Before

Swallow 2 place (customer furnish OX-5 motor and prop.)	$1595
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Swallow 2 place, Equip. brand new OX 5 motor, complete fly away	1990
Swallow 2 place, Kinner powered, new type motor with exhaust ring, complete fly away	2990

Air wheels slight extra charge

There are licensed, approved type airplanes now under production at our factory.

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SWALLOW AIRPLANE COMPANY
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120 HP.

10 cylinder radial air cooled
Rebuilt to American Specifications
Crank pins to American standard size
American standard cylinder bore
Aluminum alloy pistons
Floating piston pins, aluminum retainer plugs.
Mechanically operated intake valves.
Two Scintilla magnetos double ignition
Intake manifold heater and oil cooler.
Gear pressure and scavenger pumps.
Babbitt connecting rod bearings.

A reliable economical and long wearing Engine and suitable for any class of plane.

These Engines are new equipped and ready to run complete with all equipment ring manifold for exhaust and propeller hub at the special price of

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Crated f.o.b. cars $200 with order bal ance on delivery. Only a limited number for sale act quickly

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Fisherville R 1

FOR SALE

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4D. 3-place open cockpit, Wright J-6 seven cylinder, 240 hp. De Luxe equipment, landing lights flare brackets electric starter, etc. Total time 150 hours

BELLANCA AIRCRAFT CORPORATION
New Castle Delaware

FOR SALE

MODEL F WACO

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Warner Powered Inland Super-Sport

INLAND is duplicate of model which proved fastest of all open cockpit airplanes in 450 cu.in. class at National Air Races. Has exceptional instrument equipment and metal propeller. WACO is equipped with Navy metal ship Heywood starter exhaust manifold metal propeller. These airplanes bought new by us for engine demonstration. Both exceptionally well cared for (Inland) be sold from new. Priced reasonably

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$1500 Cash

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BELLANCA AIRCRAFT CORPORATION
New Castle Delaware

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WANTED

Open or Cabin Ship

2 or 3 place. Not necessarily in flying condition. Must be very cheap. Will pay cash. Write telling condition hours etc

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11—Curtiss OX5's 2—Curtiss OXX's
10—Hisso Model A's 5—Hisso Model E's
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Six place. Total time on ship and motor 284 hours time on engine since overhaul 80 hours. Ship will be entirely reconditioned and sold for $6 000

BELLANCA AIRCRAFT CORPORATION
New Castle Del

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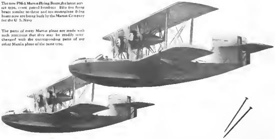
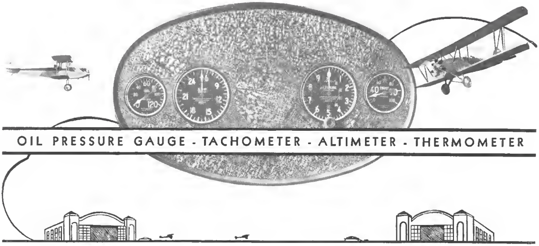
Boeing tri-motored transport ship flying at night The Boeing Company uses Stanavo products in all its planes, flying twelve thousand miles every twenty-four hours.

The new PM-1 Martin Flying Boats, the latest service type, coast patrol bombers Fifty five flying boats similar to these and ten monoplane flying boats now are being built by the Martin Company for the U. S. Navy

The parts of every Martin plane are made with such precision that they may be readily interchanged with the corresponding parts of any other Martin plane of the same type.





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